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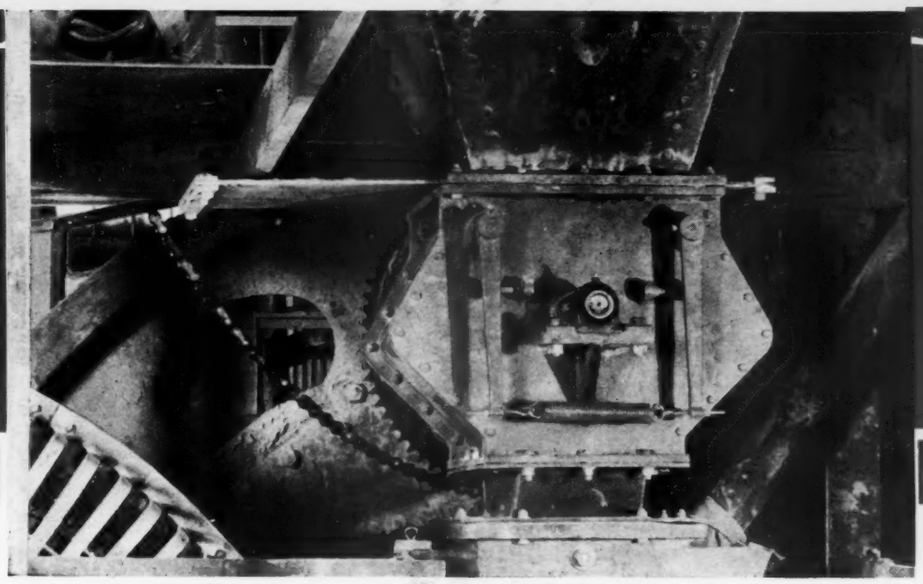
Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Chicago, July 4, 1931 Issued Every Other Week Volume XXXIV, No. 14



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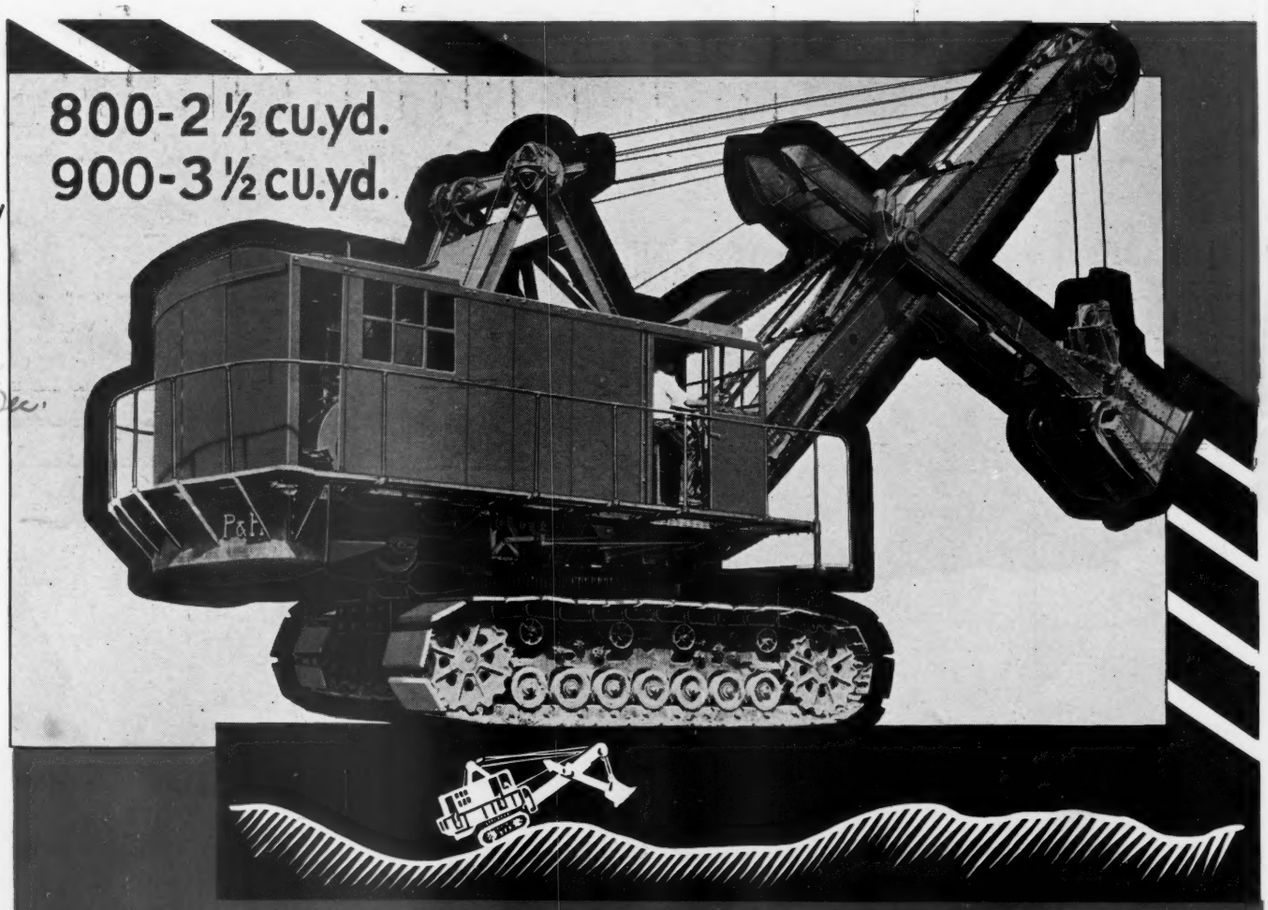

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Keeping a Material Operation Modern

St. Louis Material and Supply Co.'s Plant Originally Built in 1917. Completely Rebuilt Since — Concrete Bins for Wood, Diesel Engine Power for Steam and Other Important Changes

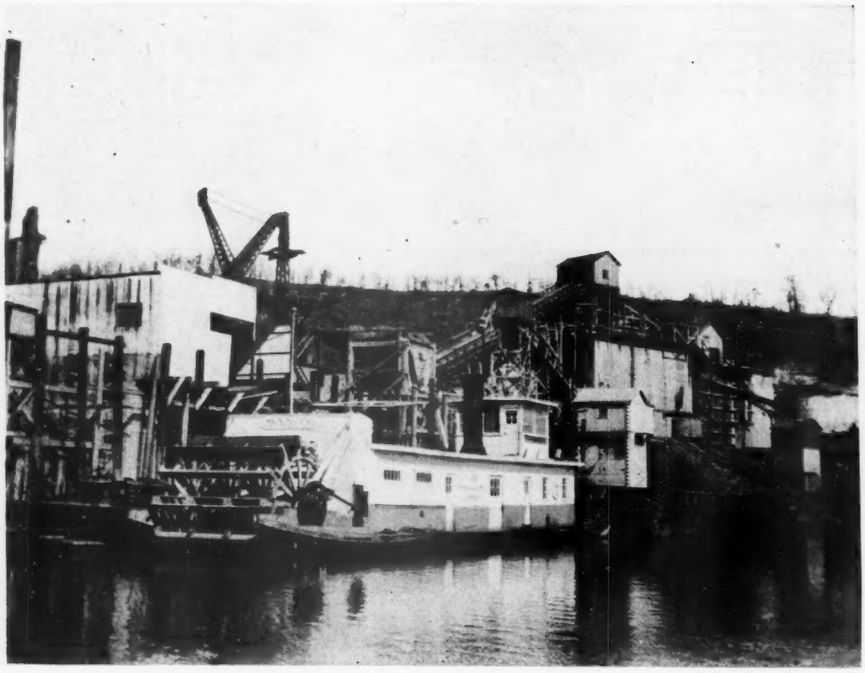
Diesel-engine-driven tow boat and unloading derrick

PRACTICALLY ALL of the gravel used in the St. Louis district is taken from the Meramec river valley a short distance west of the city, where this river and its banks provide an abundant and easily obtainable supply. At the present time seven plants, operating part time, supply this demand. At Jedburg and Yeatman, adjacent towns on the Missouri Pacific railway about 25 miles west of the city, the Standard Building Materials Co. has a large plant and the Central Building Materials Co. two smaller plants.

In the vicinity of Pacific, Mo., about 35 miles west on both the Missouri Pacific railway and the St. Louis and San Francisco railway, are four plants operated by four different companies, the Standard Building Materials Co., St. Louis Material and Supply Co., Denton Sand and Gravel Co. and the Modern Coal and Material Co. The last named is the newest operation and is smaller than the others, using a dragline instead of a pump for excavating.

Although not the largest plant as to output, the Pacific plant of the St. Louis Material and Supply Co. is particularly interesting because of the use of Diesel engine power on both the dredge and the tow boat, and because of the savings thus effected over the previous steam operation.

Originally built in 1917, the plant has been enlarged and changed from time to time,



General view of plant from river side, with tow boat in foreground

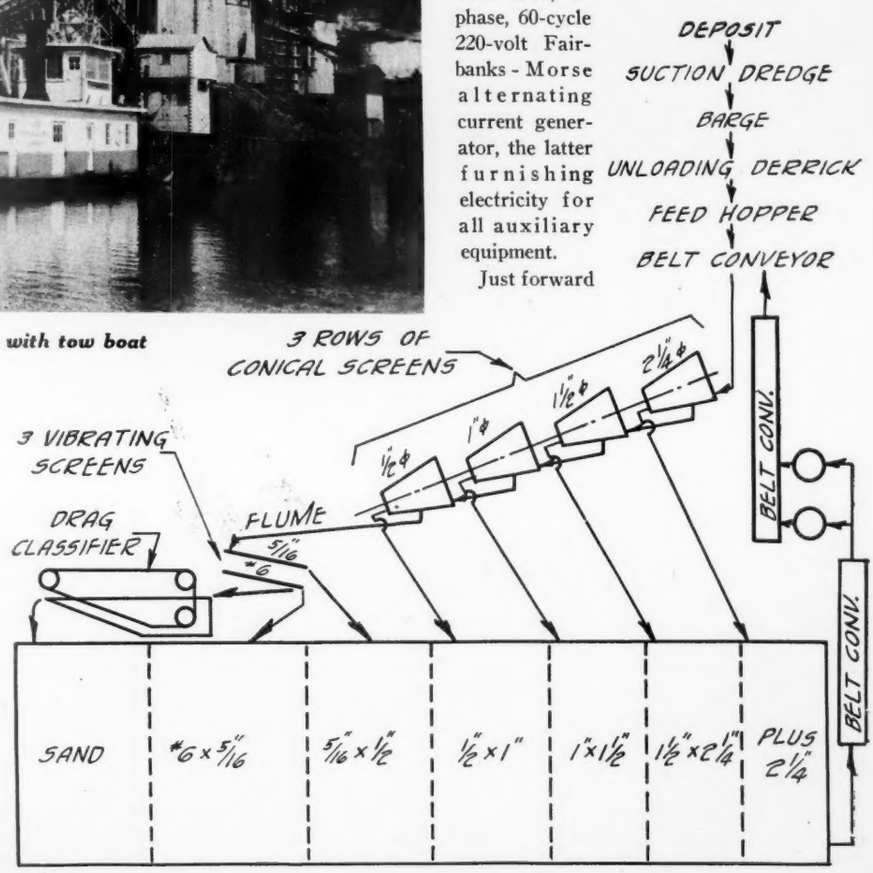
wooden bins being replaced by concrete bins, and vibrating screens added for the better separation of the smaller sizes. A drag scraper was first used for excavating, then a steam-driven pump dredge in connection with barges and a gasoline engine tow boat. The steam dredge was replaced about three years ago by the present Diesel engine dredge and a new Diesel engine tow boat was put into service in May, 1930, to replace the old tow boat. Both have proven satisfactory and have shown substantially lower operating costs than the previous units.

Dredge

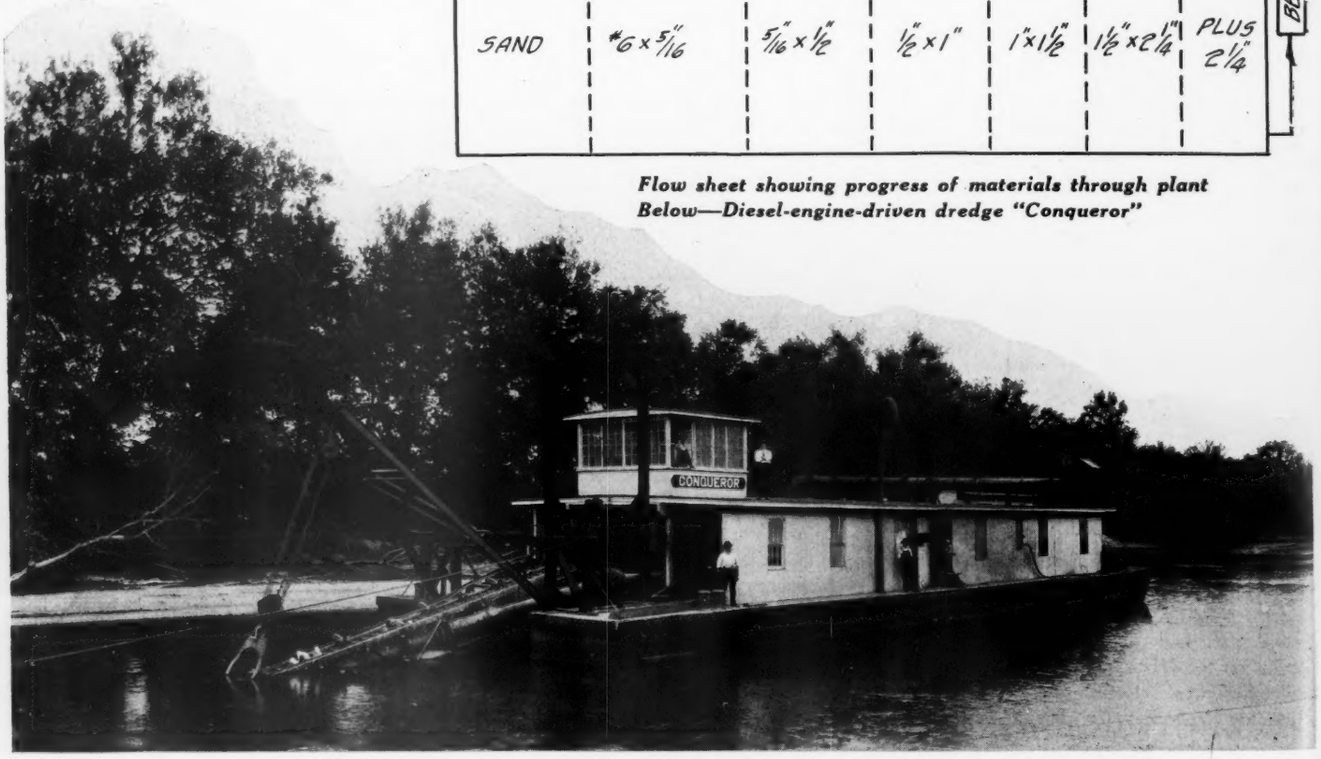
The dredging unit comprises a wooden hull, 30 ft. wide by 110 ft. long by 6 ft. deep, which was built at the plant, and upon which is mounted the engine, pump and auxiliary equipment.

Power for the dredging operation is furnished by a 360-hp. 6-cylinder Fairbanks-Morse Diesel engine mounted on the rear end of the hull and direct-connected to a 175-kw., 3-phase, 60-cycle 220-volt Fairbanks-Morse alternating current generator, the latter furnishing electricity for all auxiliary equipment.

Just forward



Flow sheet showing progress of materials through plant
Below—Diesel-engine-driven dredge "Conqueror"



From top of bins looking toward dredge

View of plant from vicinity of dredge

of the alternator a Cutler-Hammer magnetic clutch is inserted in the drive shaft, which extends from the engine to the 15-in., manganese-lined, Morris centrifugal pump, located on the forward end of the hull. By means of this clutch the pump is controlled from the pilot house by push-button.

The pump is arranged with the discharge outlet on top and manganese-steel elbows and pipe sections carry the discharge line across the top of the deck house and over to one side above the barge.

Here the end of the discharge line is provided with an interesting loading arrangement in the way of an adjustable loading bonnet, or trimmer, as indicated in one of the pictures. By means of a small hand winch and cables the trimmer is easily tilted one way or the other so as to direct the stream of sand and gravel to one side or the other of the barge as may be necessary for proper loading. The barges are of the deck type so that the excess water runs off as they are loaded. For moving them forward or backward while loading, a motor-driven drum hoist on the dredge is used, with cables running to each end of the barge.

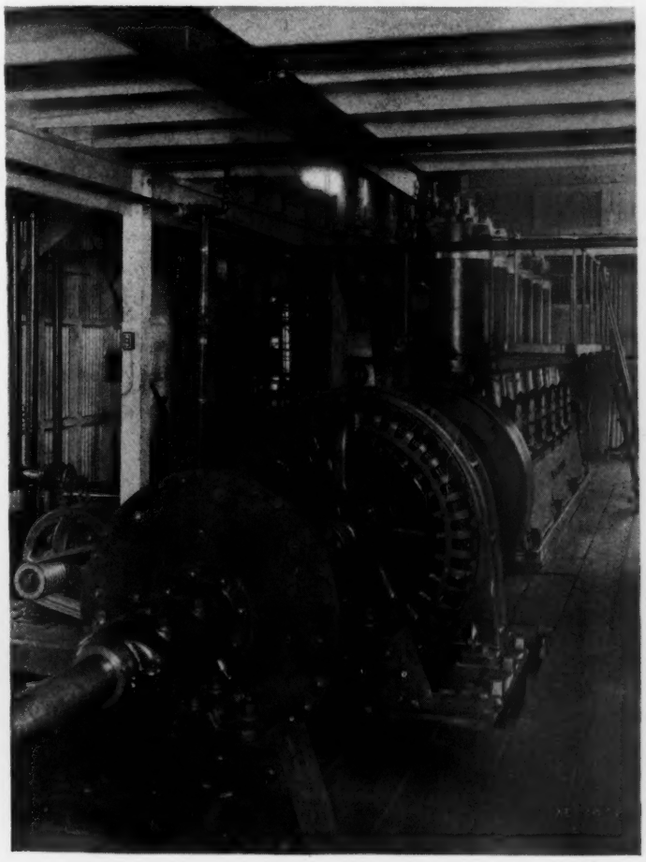
Screen Nozzle Ladder

The pump suction line is arranged with a 40-ft. "Eagle" Swintek screen nozzle ladder, which is driven at a speed of about 30 ft. per min. by a 40-hp. motor. This was at first swung from the forward end of the hull, but pontoons were later added to support part of this weight.

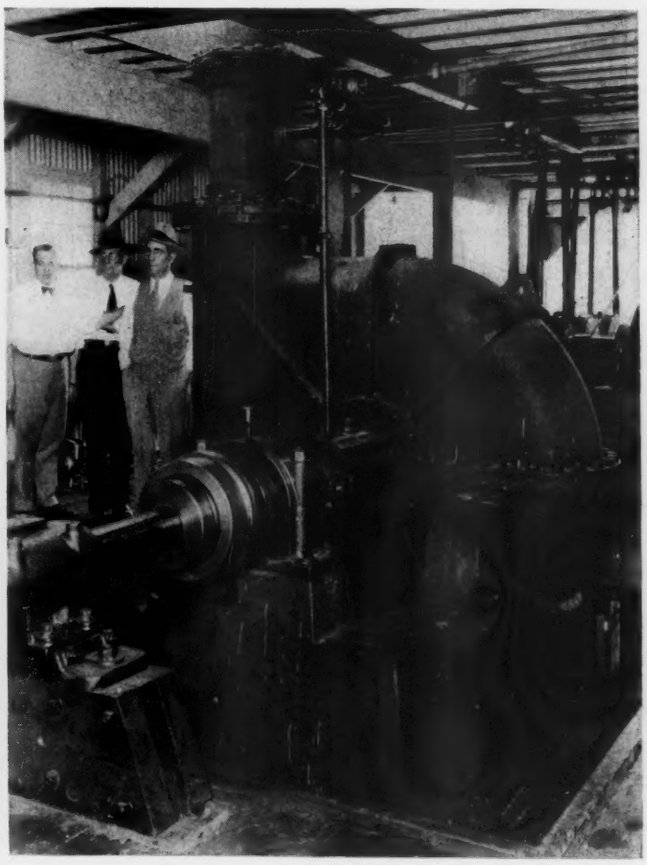
For raising and lowering the ladder and suction line, and for controlling the position of the dredge by means of land lines, a 5-drum hoist is used, with 30-hp. motor.

The clutch lever and brake lever of each drum, 10 levers in all, are located in the pilot house, along with push buttons for both motors and for the magnetic clutch, so that the operator in the pilot house has complete control of the dredging operation.

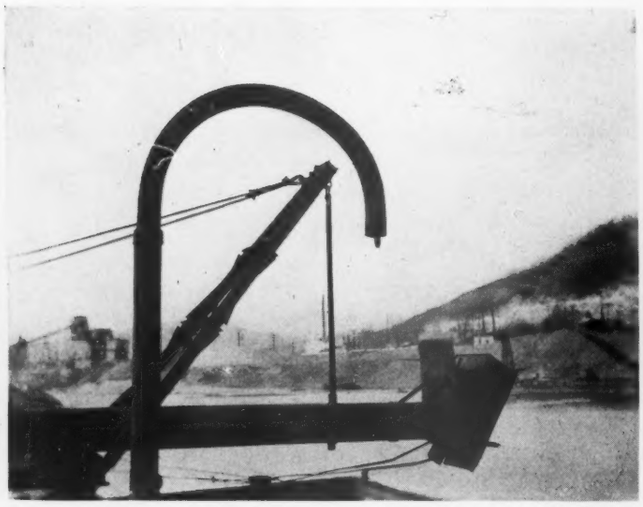
Dredging is done to a depth of about 25 ft. below water. For washing down the bank above the water a set of two single-stage Morris centrifugal pumps in series, driven by a 60-hp. motor, provides water at



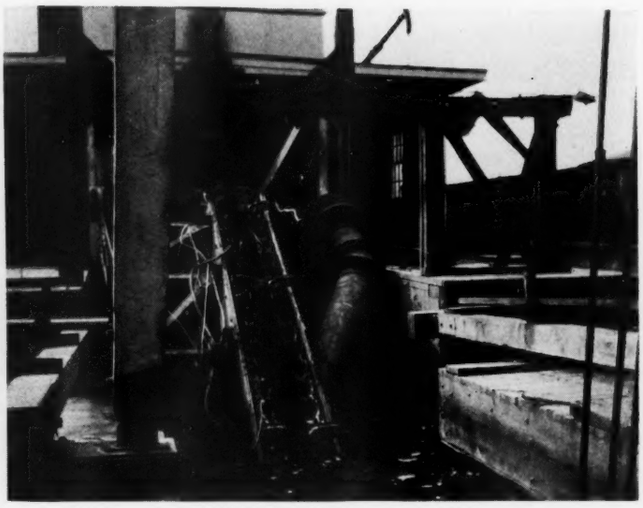
Diesel engine on dredge, with generator and magnetic clutch



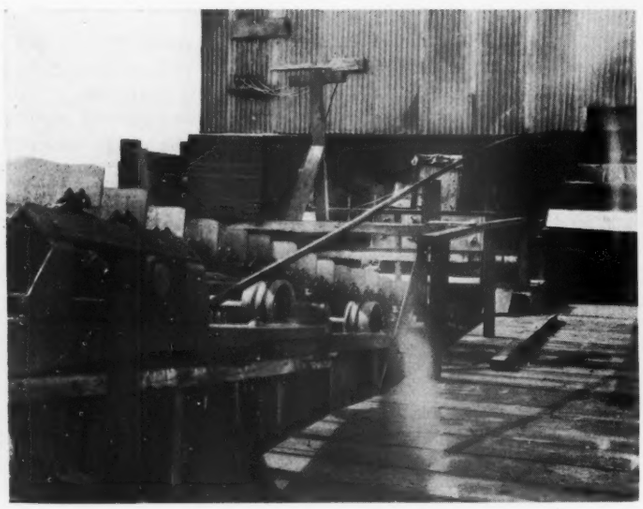
The 15-in. manganese lined dredging pump



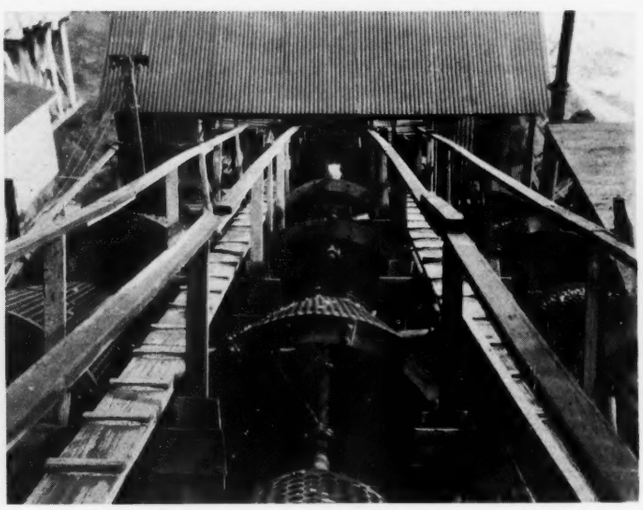
Adjustable discharge bonnet or trimmer used in loading



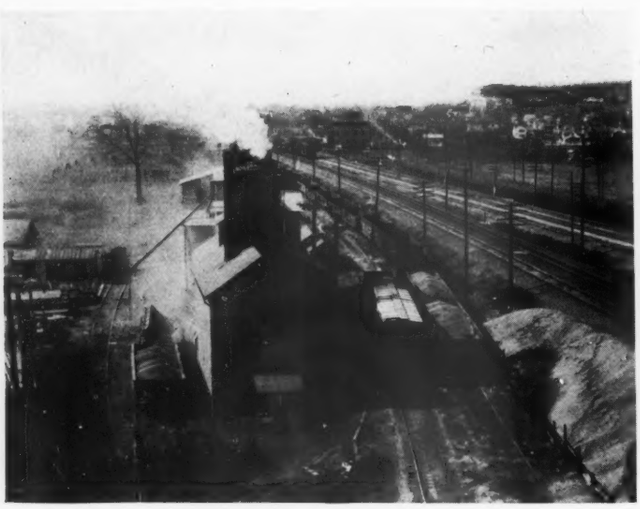
Screen nozzle ladder and suction line on dredge



Sand dewatering conveyor with vribrating screens beyond



Looking down along the conical screens at washing plant



Roofing grit plant, from top of bins

Unloading point, from top of bins

General view of washing plant and loading bins

120 lb. pressure. A small Fairbanks-Morse centrifugal pump with 10-hp. motor furnishes water for the pump bearing seal, for priming and for general purposes.

The fuel oil used by the engine is carried in four 500-gal. tanks connected together to give 2000 gal. storage capacity. These are periodically filled by gravity from a 6500-gal. tank barge, which in turn is filled by gravity from a shore tank of 10,000 gal. capacity. The oil is received in railway tank cars of 8000 to 10,000 gal. capacity.

The usual fuel oil consumption of slightly under 0.5 lb. per hp.-hour is obtained in the Diesel engine, or approximately 225 gal. per 10-hour day, which, with fuel oil at 4c per gal., makes a fuel cost of $9 per day plus $1 for lubrication, or $10 per day total fuel cost. This compares very favorably with the coal and steam power previously used, which ran better than three times that amount for fuel cost.

Three men operate the dredge.

Barges and Tow Boat

At present the dredging is being carried on only a short distance (less than a quarter of a mile) from the washing plant. For the transportation of the sand and gravel to the plant four wooden barges of the deck type are used. These are 26 ft. wide by 106 ft. long and are capable of handling 250 tons each, but are usually loaded only to about 200 tons.

They are moved between the dredge and the unloading point at the plant by a Diesel-engine-driven tow boat of the usual river type, with a rear paddle wheel. A 120-hp. 4-cylinder, Fairbanks-Morse Diesel engine, located forward, furnishes power through a longitudinal shaft to a Medart enclosed bevel gear reducer unit aft, from the extended shafts of which the paddle wheel is driven through a steel roller chain on each side. Complete control of the engine and clutch is in the pilot house.

This boat was put into service in May 1930, and has proven entirely satisfactory for this work, the fuel cost of $3 per day being reported as less than one-third that of the old gasoline-powered tow boat.

Unloading

A Lidgerwood derrick with a steel boom and a 2½-yd. Hayward bucket and mounted alongside the pier is used for unloading the barges. These are unloaded in less than an hour, or at the rate of 11 or 12 per 10-hour day, the bucket emptying to a hopper over the belt conveyor carrying up to the washing plant.

The derrick is at present a combination steam and electric rig, steam being used for the hoisting and the boom, and electric power for the swinging. A reversible drum controller located alongside the controls of the main engine is connected to a slip-ring motor which is geared to a drum hoist for swinging the boom.

A steam engine drum hoist with cables running to each end of the barge controls the movement of the barge during unloading. Thus the whole unloading operation is under the control of the hoist operator.

Washing and Sizing

From the hopper at the unloading point the material is fed to a 30-in. inclined Stephens-Adamson belt conveyor and carried up to the top of the plant where it discharges with water to three parallel rows of Link-Belt conical screens, four in tandem in each row. These are arranged with screen plates of 2¼-in., 1½-in., 1-in. and ½-in. round holes, successively, and the corresponding sizes spouted to the bins below, the oversize going to the end bin, from which it is carried by belt conveyor to two 6-in. Allis-Chalmers "McCully" type fine reduction crushers for recrushing. From these crushers the material is returned on an inclined 20-in. belt conveyor to the main 30-in. conveyor.

Additional water jets are used in each conical screen, the water for the main hopper being furnished by an 8-in. pump of 2000 g.p.m. capacity, and the water for the jets by a 6-in. pump of 1000 g.p.m. capacity. Both are Allis-Chalmers centrifugal pumps with direct-connected motors.

Rubber Spout Liners

Rubber liners in a number of the spouts carrying the larger sizes are of interest as showing little if any wear after being in use two years, whereas steel plate liners in the same spouts must be replaced twice a year.

The minus ½-in. material passing the lower conical screens is flumed to three 4-ft. by 6-ft. double-deck vibrating screens which are equipped with 5/16-in. mesh cloth on the upper deck and 6-mesh on the lower deck. The material passing over the upper deck is spouted to the bins as the smallest size gravel, and that passing over the lower deck is a torpedo size used for roofing and some road covering. Everything passing through the lower deck is flumed to a settling box, which has a 4-ft. flight conveyor for dewatering, and delivers the sand to the bin below.

One "Plat-O" and two "Niagara" vibrating screens are used.

General

The plant equipment and pumps are all arranged with individual motors of various makes operating on 3-phase, 60-cycle, 220-volt purchased electric current.

A new shop and office of steel and concrete is being constructed, which will be equipped with the usual motor driven tools such as drill press, lathe, grinding wheels, hack saw, etc.

For handling excess material to and from storage piles an Orton and Steinbrenner steam locomotive crane is used, and the switching of cars while loading at the bins is done by a 60-ton steam locomotive.

Also of interest is the production at this plant by the Advance Industrial Co. of buff-colored roofing grit for shingle covering, this being understood to be one of two plants in the country making material of this color. In making this material the smallest gravel sizes are crushed and screened down to about 20-mesh size, using roll crushers and "Hum-mer" vibrating screens, preceded by a coal-fired gravity dryer. The material is packed in jute bags and shipped to all parts of the country.

The offices of the St. Louis Material and Supply Co. are at 314 North Fourth street, St. Louis, Mo. Edwin H. Conrades is president, Otto S. Conrades is vice-president and general manager and F. J. Reinke is chief engineer.

Economics of the Nonmetallic Mineral Industries*

Part V—Marketing Problems—Finding Markets

By Raymond B. Ladoo

Manager of the Industrial Commodities Department, United States Gypsum Co.

AS NOTED before, markets are of first importance. The finding of markets then is the first step. But this is not an easy task. The development of sales possibilities through market surveys is a problem which many large companies, to say nothing of the smaller ones, have not yet solved to their satisfaction. It is often most difficult to find out just where a product is being sold, what prices are being paid, how much is being sold and of what quality. For some commodities, such as portland cement, prices and the major markets at least are fairly easy to discover. Accurate statistics of production and consumption by geographical divisions are published, as well as more or less detailed accounts of plant capacities, equipment, etc. Prices are quoted in trade journals and are easily obtainable from building material dealers. Generally speaking, market surveys of building materials are fairly easily made. Crushed stone, sand and gravel, building stone, lime (structural uses), gypsum plaster (structural uses), etc., are in much the same position as portland cement.

Industrial Markets Hard to Survey

But when we start to get market information on mineral products used by industries, particularly the smaller ones or those in which the mineral product plays an inconspicuous (though often important) part, we frequently meet with an almost impenetrable fog. Statistics of production published by the Bureau of Mines or the Bureau of Foreign and Domestic Commerce are usually not "broken down" into sufficient detail by quality, value, source of production and point of sale to give much of an idea of just where definite markets exist for a given material of definite physical and chemical properties. We hear every day of unusual or little known uses for mineral materials, often in large volume, in industries which would seem to have no possible use for a mineral product. These obscure markets are often the life blood of small and even medium sized plants.

For example, a producer of crushed limestone may be doing a fairly large and certainly a profitable business. Business men in the vicinity look with envious eyes upon this plant, and finally decide they ought to go into the crushed stone business, too, and help skim a little of the cream off the stone market. So they get a deposit, build a crushed stone plant and go ahead. They suddenly wake up to the fact that the actual average sales prices on crushed stone (due to discounts and low priced contracts) are not nearly as high as they figured, and their costs are higher. The attractive profits they expected fail to materialize. But still their competitor is running along and making good profits.

Special Products Usually Require Special Properties

Eventually they discover the answer to the problem or part of it at least. Their competitor is somewhere selling part of his screenings—a waste product with them—and is grinding to a fine powder and selling more of his screenings. "So that's the answer. All right, we'll put in fine grinding and screening equipment," they say. And they do. But then comes the problem of selling the screenings and ground limestone. That isn't so easy and prices again seem awfully low. The obvious markets for ground limestone are for agricultural limestone and asphalt filler. But these are highly competitive markets, selling costs are high and prices are low. At that, though, profits are better than on crushed stone; but they are only partly satisfied, for they realize they are not yet in the best paying markets. Eventually they find out that their competitor is selling on contract at good prices large amounts of fine ground limestone as a filler in making linoleum and oilcloth, as a rubber filler, and for other specialized uses. Exhaustive and time consuming tests finally convince them that, due to certain inherent chemical and physical properties of their limestone, it is not suitable for use in the industries which pay the highest prices.

Detailed Market Surveys Essential

The point of this example is not so much that they failed in the end, but "How could they, or anyone else in a similar situation, have avoided this failure?" The answer is a thorough and detailed market survey made by a competent man. This is easy enough to say but not so easy to do. First, a good survey costs money and takes a long time. Most people want results in a hurry and many are not willing to pay a fair price for the services of an able consulting engineer or market analyst. They will pay a lawyer his fees to get them out of trouble, or a doctor to cure their physical ailments, but all too rarely are they willing to pay for expert technical advice to keep them out of business trouble. Second, it is difficult to find a suitable man to do the job and to recognize an able man from an incompetent one. Third, the sources of reliable information are usually few and difficult to locate and to open up.

Sources of Information

Among the most fruitful sources of information in the earlier stages of a mineral market survey are:

Statistical and technical publications of the
- U. S. Bureau of Mines,
- U. S. Geological Survey,
- U. S. Bureau of Foreign and Domestic Commerce,
- U. S. Bureau of Census,
- U. S. Tariff Commission,
- State bureaus of mines, geological surveys, industrial commissions, etc.

Editor's Comment

MARKET SURVEYS, their importance in judging the possibilities of success of a new enterprise, or a new product, and how to go about getting such a survey, are the subjects dealt with in this installment.

Market surveys for building materials are relatively very easy to make, which doubtless in some measure accounts for the popularity of such fields with promoters. Rightly made and rightly used, however, the easier market data are obtained, the stronger bulwark such a survey should be against "over-planting" an industry.

Except in the case of very special products requiring very special properties, the producer has everything to gain by full exposure of market data. Where a producer has a special product and a special market for it, obviously secrecy regarding details may be entirely defensible.—The Editor.

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Files of technical and trade papers such as ROCK PRODUCTS, *Engineering and Mining Journal, Chemical and Metallurgical Engineering, Journal of Industrial and Engineering Chemistry, Pit and Quarry, Ceramic Industry, The Ceramic Age, etc.*

Industrial departments of the large railroads.

Local and national chambers of commerce, boards of trade, etc.

Letters to and personal calls on federal and state bureau officials, editors of journals, trade association officials, dealers and jobbers, etc., often develop "leads" to other sources of information. Care must be taken, however, to give proper weight and credance to personal opinions of more or less interested parties, particularly dealers and jobbers. The life blood of jobbers of minerals and chemicals is their knowledge of obscure markets. They do not want the producer and consumer to get together, for then the jobber is eliminated. On the other hand they must have access, exclusive if possible, to adequate and desirable sources of raw materials. They must have something to sell. So they often encourage a new producer on the one hand by painting a rosy picture of how much they can sell and at the same time give erroneous information or no information at all as to specific consumer markets. Most sources of information (except government statistical bodies) are biased in some way. Chambers of Commerce are usually unduly optimistic as are often railroad industrial departments. Data on each essential point should be gathered from as many sources as possible, representing widely varying viewpoints, so that well balanced conclusions may be reached.

Study of Competitive Materials

After preliminary data on general market requirements are available and samples of competitive materials collected, the new raw material should be prepared in some good laboratory or commercial plant into samples as near like the competitive products as possible. These samples should then be submitted to several different consumers for examination and test. This, by the way, is a very slow and disheartening job.

Many purchasing agents and some plant laboratories "test" a new sample by the "shelf and waste-basket method"—a few weeks or months on the shelf and then into the waste basket. Most plant laboratories are loaded down with routine plant control and testing work. Outside samples come in all too frequently and get to be a nuisance. So, usually, the testing of new samples is put off as long as possible. When it is possible to "get by" the purchasing agent and talk to the plant superintendent or chemist or both, the plant men may be interested and "sold" on the new product to a point where a sympathetic test may be made within a reasonably short time.

This plant manufactures silica tube-mill lining blocks

Plant Test Data

The data acquired from plant tests must also be weighed and studied. A new technical product has a hard road to travel. Test data may be incomplete or erroneous, intentionally or unintentionally, due to prejudice in favor of competitor's materials, to hasty and improper testing, or to slight differences from the materials now used (not necessarily poorer or better, but different and thus requiring slightly different handling). Plants have been built on the strength of a few laboratory tests by a consumer, who later found he could not (or would not) use the product prepared in the commercial plant.

Full of Pitfalls

Every stage of the survey is full of pitfalls—data over-optimistic or unduly pessimistic. A trained impartial observer will weigh all the data and arrive at a well balanced report, while an eager and optimistic promoter of the new venture is apt to see only the favorable side of the picture. On the other hand, a well established conservative company, considering expansion in a new direction, is apt to be over-cautious and pessimistic. It has gotten into unprofitable ventures before and sees only the unfavorable side of the picture.

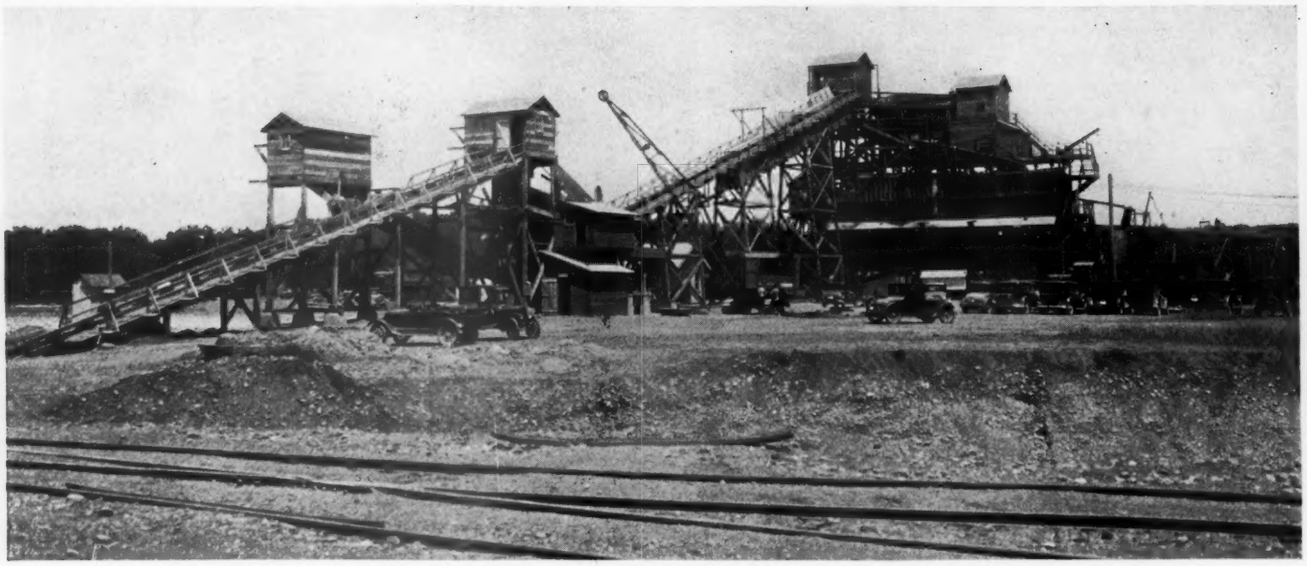
It is admittedly an extremely difficult thing to arrive at a true and safe conclusion. Often no one man or group of men, no matter how wise and experienced, can correctly judge what are the future possibilities for a new plant or a new product. The important thing to remember is that it is a difficult problem and no time or effort should be spared in trying to get a complete and accurate picture before the new plant is built.

(To be continued)

An Unusual Barreled Rock Product

THE ACCOMPANYING VIEWS show a rock product which is not ordinarily thought of as "made in the U. S. A.," or as shipped in barrels. The pictures show part of the operation of the Jasper Stone Co., Sioux City, Ia. This company's quarry is operated principally to manufacture "Adamant" silica tube-mill lining blocks and grinding pebbles. The stone is a very hard, tough quartzite, which its producer claims is superior to imported silica products in grinding and wear-resisting qualities. It is used to grind cement, silica, feldspar, enamel, etc. It has been shipped from this operation to Alaska, Canada, Mexico and Germany.

A car of tube-mill liners for export to Germany



One of the new Iowa plants, belonging to Concrete Materials Corp., Wallingford, Ia.

"Birdseye View" of Iowa Aggregate Industry

Little Production Where Roads Are Not Building—Often New Plants for Old Where There Is Business—How One Producer Is Meeting Wayside-Pit Competition

By Walter B. Lenhart
Associate Editor, Rock Products

ANY ACTIVITY in the rock products industry in Iowa is due solely to highway work. The state is practically speaking 100% agricultural; the cities and towns are of comparatively small population, with few exceptions; industries other than those related to agriculture are few and fairly well scattered throughout the state, leaving uses for aggregate and portland cement confined practically to highway and bridge construction. In those parts of the state where no highway work is being done the sand and gravel and crushed stone producers are practically out of the picture. As one Iowa producer put it when asked regarding selling methods on aggregate: "If a highway job goes by your plant you get the business; if it don't you don't sell, and that is all there is to the selling of aggregate in Iowa."

Lake View operation of Le Grand Limestone Co.

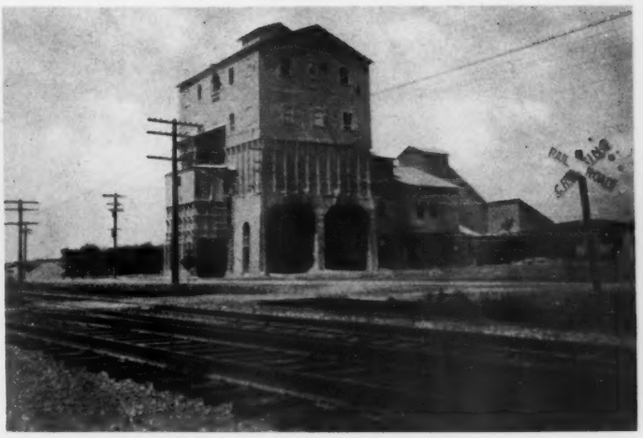
During 1929 and '30, Iowa was no laggard in the construction of good highways, so that this year finds the state fairly well supplied with good concrete arterial highways as well as a large, well distributed mileage of good gravel roads. There are, however, here and there unpaved sections on the main arterial highways yet to be paved and a larger mileage of roads to be graveled. These are scattered fairly well over the state.

Taken as a whole, there will be a larger mileage of roads graveled this year than last, but the amount of paving done will be less than in 1930. This at a glance may indicate that the producers will sell a larger tonnage of gravel and crushed stone than last year, which probably is the case with sand and gravel, but the price received for road gravel compared to that for concrete gravel is very considerably less, and the relative margin of profits still less. So even though the sand and gravel industry may show a larger tonnage this year than last, it is doubtful if profits at the end of the year will approach those of 1930.

Still More Plants Built

In spite of the fact that perhaps 10 to 15%

Dry screening to cars direct. Miller Sand and Gravel Co., Doon, Ia.



Quarry and plant of the Linwood Cement Co., Davenport, Ia.

Editor's Note

THE "BIRD" who made this "view" has tried to present a true picture of the industry, unadorned. The editor publishes it, as he has published other similar articles from the same writer, because he believes the time has come to serve our industry thusly.

Invariably in all plant descriptions the editors submit proof of the article before publication to the owners, or managers, of the plant for correction and approval. In the case of a general commentary on the entire industry of a state, as in this case, this practice is obviously impossible.

This explanation is given because our reputation for accuracy apparently is such that readers of these general surveys by Mr. Lenhart invariably call our attention to the smallest errors, such for example as mention of a 150-hp. Diesel engine, where it should have been 180-hp.

We hope such small errors of detail in these particular articles will be overlooked or forgiven, if the general picture presented by the author is an accurate one, as we believe it is.—The Editor.

of the plants that I visited in the state either were not attempting to operate at all, or were just hanging on, many new plants were placed in operation this year. The plant operations visited during May and June covered roughly 75% of all the operations in the state and roughly 4000 miles of travel. Incidentally these new plants were all built by men who were either already producers of aggregate or who have had close contact with the industry for many years, so that we can safely say that here again what expansion that has taken place within the industry was from within, not from without. Very likely some of these plants, at least, were entirely justified as replacements or to serve certain territories better.

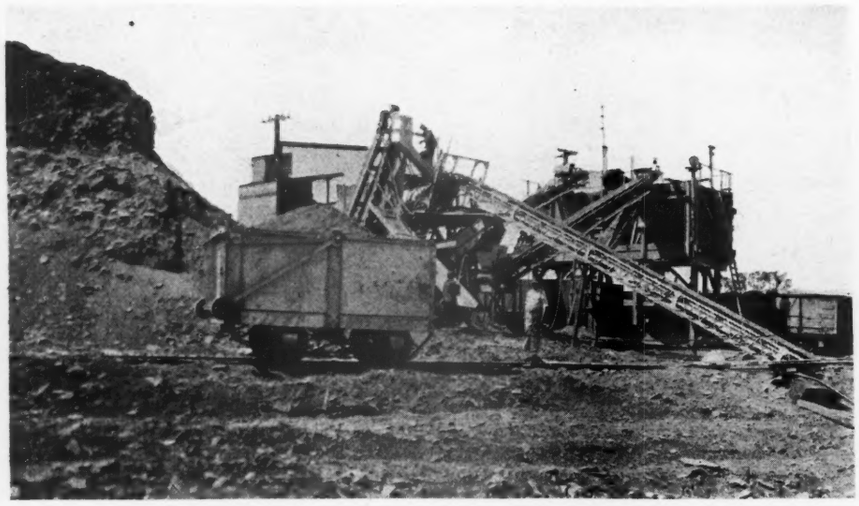
The sore spot in the situation in Iowa is the wayside pit operator, of which there are many, and the Iowa state quarry competition. The wayside operator, here today and gone tomorrow, levies a heavy toll on other than paving jobs, where washed aggregate must be used.

State Competition

While the state quarry is a sore spot in the minds of some producers, it is not a factor to contend with for the state as a whole. The operations are extremely small. The one at Croton probably could ship three cars per day, but even at that if the state quarry at Croton is shipping three cars per day and two or three quarries in the vicinity

Construction of new plant and digging of pit to float new dredge for Coon River Cooperative Sand and Gravel Association

of Keokuk are not shipping any, naturally the Keokuk producer is not strong for state quarry operations. It is my personal opinion that if the state's venture in the crushed-stone business is given enough rope it will hang itself, for ultimately the farmers in Iowa will wake up to the fact that stone produced by prison labor is costly any way they look at it.



A detail of the Iowa Falls plant, shown below

Small Local Plants

The producers have learned that once a highway contract is finished in their part of the state a great drop in demand can be expected; hence they do not put up plants any larger than necessary to take care of the contracts in question, and at the same time they attempt to keep down the original construction cost. There are exceptions to this. One of the plants constructed this year has a capacity of 60 cars per day, but for the most part the other plants built are considerably smaller.

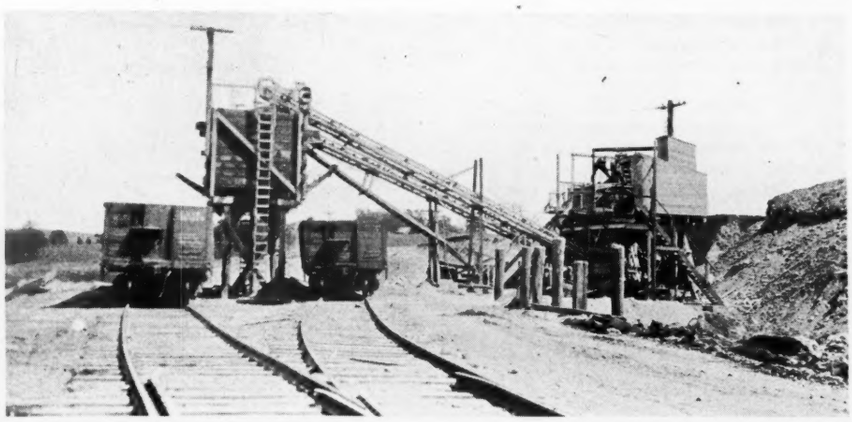
The largest plant built this year was at Wallingford by the Concrete Materials Corp., Waterloo. Other new gravel plants built were by the North Eastern Iowa Sand and Gravel Co. at Harpers Ferry, where a 20-car per day plant went into operation this spring. The Coon River Co-operative Sand Association is just placing in operation a new plant a few miles from Des Moines. This plant will use a 10-in. Amsco dredge pump. The Hawkeye Materials Co., Iowa City, placed a new 8-in. Bennett equipped dredge in operation late last year, which can be considered a new plant, for the screening equipment is all mounted on the hull of the dredge. The Iowa Falls Sand and Gravel Co., Iowa Falls, also placed a new semi-portable plant in operation this spring.

New Quarry Operations

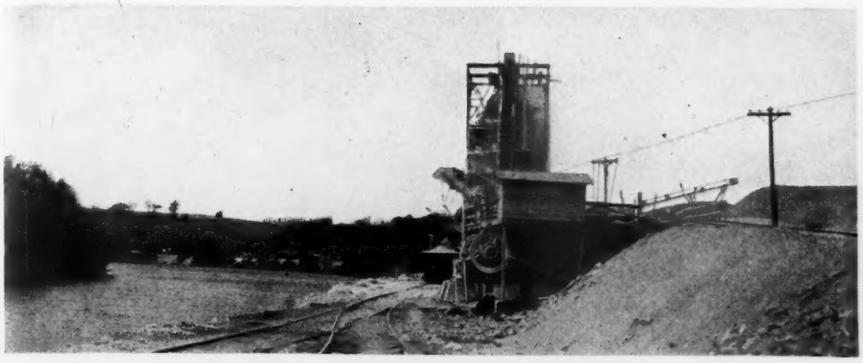
In the crushed stone field a new plant went into operation at Winterset. This plant was built by the Winterset Limestone Co. At Fort Dodge, the Fort Dodge Limestone Co. will shortly go into production, taking stone from a ledge of limestone 108 ft. below the surface, through a vertical mine shaft. Incidentally this is the first instance that we know of where a vertical shaft was sunk specifically to mine limestone for aggregate. Larimer and Shafer, sand and gravel producers at Cedar Rapids, will also soon place a new crushed stone plant in operation. The quarries have the advantage of a sizeable and growing market for agricultural limestone, as well as the aggregate field.

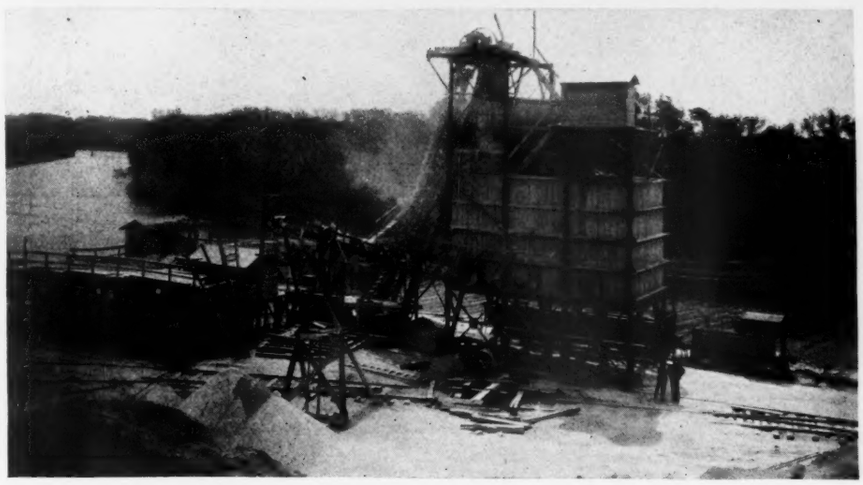
Lean years in any industry are the years when economies in operation are studied, and if the producer stays in business, are the years when he puts new ideas and new units into operation that will cut his operating costs. During the boom years producers were willing to pay for apparent conveniences, but we now find them looking about for methods of reducing costs, even a few cents per ton. Some are even going to the extreme of false economy by making their own equipment where possible. This was

The crusher is more of a hammer mill than a crusher



Plant and pit of Iowa Falls Sand and Gravel Co., Iowa Falls, Ia.





End and side views of plant of River Products Co., Iowa City, Ia.

especially noticeable in the case of vibrating screens. Sellers of second-hand equipment also have flourished since several of the "new" plants have some used equipment, although a larger part of the stuff is new.

Mostly Glacial Gravels

The gravel deposits of Iowa are glacial in origin. The sheets of ice that swept down from the north covering what is now the states of Wisconsin and Minnesota did not wholly cover the state of Iowa, but rather fringed it across the northern half, so that from approximately the longitude of Des Moines north there is plenty of gravel. Every hill or uplift is a potential gravel pit, although the deposit may or may not be overlaid with considerable overburden. To the south of this line, however, gravel becomes scarcer, so that as we get toward the Missouri line it is practically out of the picture except along the eastern (Mississippi river) boundary, where the Illinois ice sheets provided a gravel supply. The hypothetical line that separates the gravel areas from the non-gravel areas is not a straight line by any means, on the contrary it weaves a jagged line across the length of the state.

The proportion of gravel to sand is considerably smaller than in more easterly glacial deposits. The banks run perhaps 20% plus ¼-in. and 75% sand. Of the coarse material probably less than 2% is over 3-in. in diameter, and here and there shot through the banks can be found boulders that would weigh up to several hundred pounds. But the main bulk of the gravel is from pea size to 1½-in.

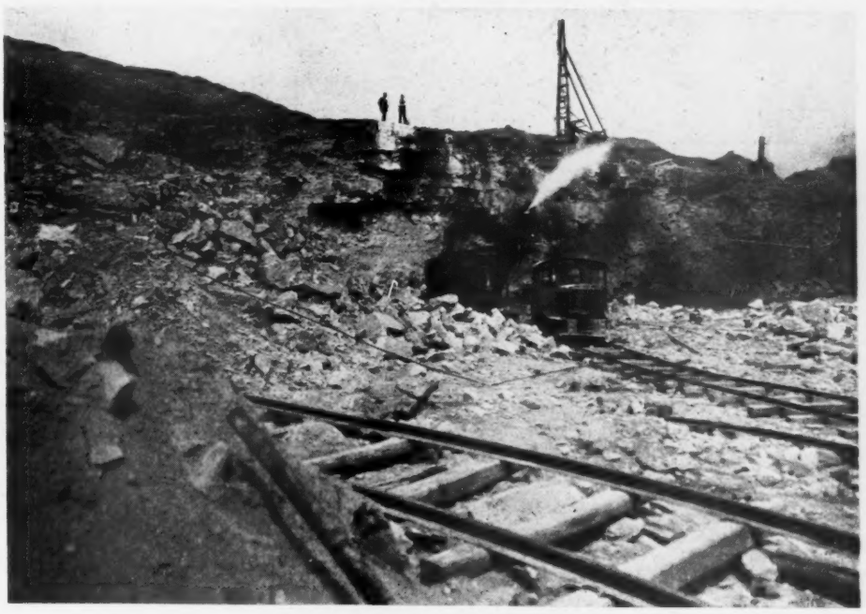
There was reported to be one exception to this general statement, and that is a newly located gravel deposit in the southeastern part of the state in the vicinity of Farmington, where the interests that own the Douds Stone Co., at Douds, have located a deposit that will run 75% gravel. This was said by engineers who have examined the deposit to be from the Illinois glaciers, which if true, upsets an old theory of some geologists that the Illinois ice sheet did not go over into Iowa. Regardless of the theories involved, the interests that own this deposit are planning on installing a new washing and screening plant.

General Operating Features

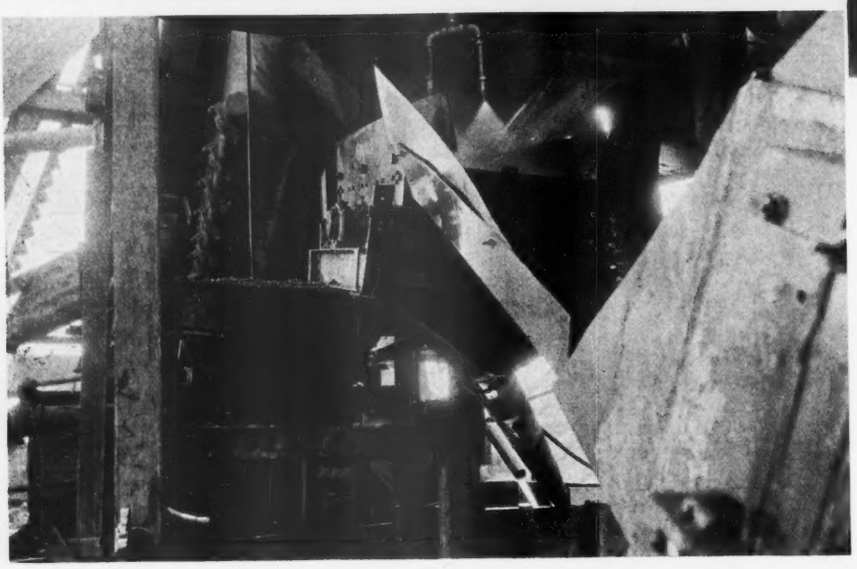
Owing to the scarcity of gravel and due to the presence of boulders, practically all the plants visited have one or more small crushers for reducing oversize. The Universal and Cedar Rapids jaw crushers are used extensively for this work. One of the newer plants is installing two used McCully gyratory crushers for this purpose.

Some of the gravel in the state is free from any impurities but for the most part the deposits have some freak foreign material to contend with. In some cases it is coal, in others it is clay or silt, but shale is the most common offender. To remove the shale and coal from the gravel the Eagle Iron Works washer finds a very extensive use; and it was said to work very satisfactorily. So-called "iron oxide" also is another offender in many of the gravel deposits. This is a soft, reddish colored stone, unsuitable for aggregate, and a stone which the highway department insists on keeping at a low content percentage. The only way that the iron oxide is removed is by hand sorting from sorting tables or belts.

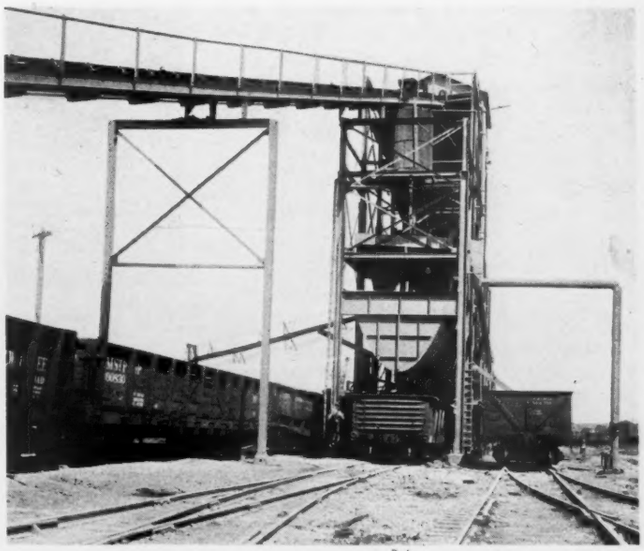
It is possible in most of the northern Iowa deposits to find here and there gravel particles that are apparently sound but when fractured reveal a "heart" of soft clay.



Quarry of River Products Co.



Plant of Ottumwa Sand Co., Ottumwa, Ia. General view above, with one new classifier just being installed. Left—Spray nozzles on a 2 by 3-ft. vibrating screen. Below—Dredge boat carrying 8-in. sand pump. Corner detail—Special tail pulley used on bucket conveyor



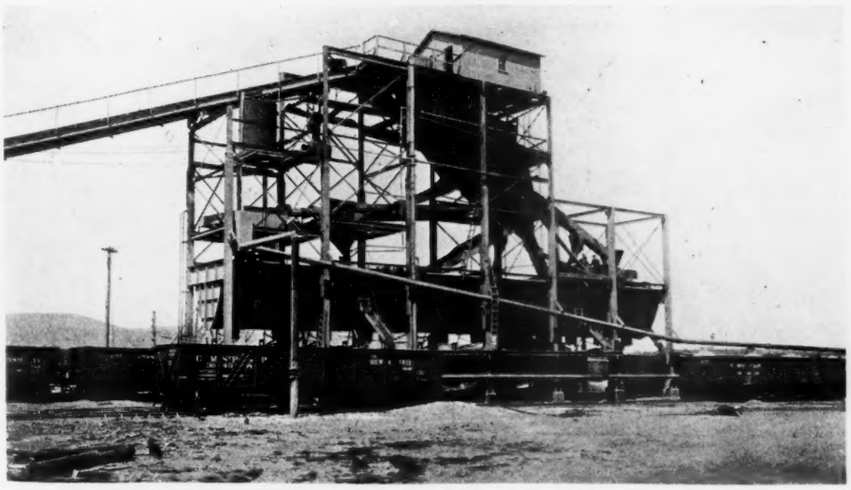
At plant of L. G. Everist, Inc., Hawarden, Ia. A 3-yd. walking dragline is used for loading in the pit. Note the parabolic steel bins at loading point

These also are sorted out by hand when possible, but of course can be discovered only when the gravel is broken or cracked.

Quarries Relatively Scarce

In view of the above conditions it might appear that the crushed stone industry would have the "edge," but fortunately or unfortunately (depending on one's point of view) Iowa is not overly supplied with easily workable quarries. Several operations mine stone; notably the Douds Stone Co., at Douds, which recently started mining by driving tunnels from the old quarry floors into the breast. Many of the quarries have considerable overburden to contend with, others have seams of inferior stone that have to be hand sorted, etc. There are numerous exceptions, for the Marquette Crushed Stone Co. has an excellent stone that presents no particular quarry problem other than its toughness and hardness. Likewise at Dubuque the Dubuque Stone Products Co. has a very good quality of stone that is not difficult to quarry. Farther down the Mississippi river, at Davenport, the Dewey Portland Cement Co., the Linwood Cement Co. and Dolese Bros. all have good quarries and high grade products. Likewise the quarry of the River Products Co., Iowa City, is a regular and consistent producer of good crushed aggregate.

In the north central part of the state the Iowa Limestone Co. has a quarry at Alden which is operating steadily and producing good stone from a stratified deposit that gives it a very favorable powder cost. At Le Grand, the Northwestern railroad and the Le Grand Limestone Co. are also operating steadily. The former quarry has considerable overburden to contend with, but at that it is a very creditable operation. The latter company, incidentally, has a sand and gravel operation at Lake View that operates under the name of the Le Grand Limestone Co. too.



General view of screening and washing plant of L. G. Everist, Inc.

Largest Operator

Probably the largest producer of sand and gravel in the state is the Concrete Materials Corp., with offices at Waterloo. This company has plants at Waterloo, Clarksville, Humboldt and Eddysville, Iowa, and one crushed stone plant at Bethany, Mo. At Wallingford, Ia., the company placed a 60-car per day plant in operation this spring.

For the production of sand alone the Ottumwa Sand Co., Ottumwa, is a large and progressive producer. The company produces some gravel but centers most of its activities on building and concrete sand. Recently it installed a third Shaw classifier as one step in its program to produce a better and more accurately graded product.

The gravel produced passes over a 2- by 3-ft. Simplicity vibrating screen on which water is sprayed. Instead of picking up any old kind of junk for a spray nozzle (which is all too common) these operators have installed Binks nozzles, which use a minimum amount of water but at the same time reach all the screen area and under sufficient pressure to do a real thorough job of rinsing. The oversize falls to the bucket elevator which is provided with Sprout-Waldron fluted tail pulley. It was said that the tail pulley has made it possible to get three times the former wear of the elevator belt.

A Sales Cooperative

A large part of the sand and gravel produced in the Des Moines area is sold through a central sales and distributing organization known as the Central Sand and Gravel Sales Co. H. B. Haight is in charge of this company's affairs. To conform with the laws under which it operates the producer members of this sales organization have each changed their corporate name so as to have the term "Co-operative" or 'Co-operative Association" a part of the company name.

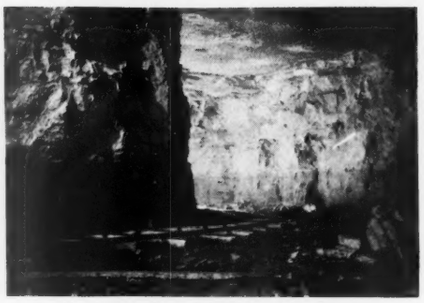
The members of this cooperative sales company are: the Des Moines Sand and Fuel Co-operative Association, the Coon River Co-operative Sand Association, the Independent Sand and Gravel Co-operative Association, the Builders Co-operative Sand Co., the Hawkeye Co-operative Sand and Gravel Association, Capital City Co-operative Sand and Gravel Co. and the Portland Co-operative Sand Co.

The sales company pays each member company a price throughout the year that is based on a certain monthly price average. The sales company makes a certain fixed charge for selling and the members do no selling, nor do they quote prices. Tonnages are prorated on previous sales.

There are three producers in the district which do not sell through the organization.

Ready-Mixed Concrete Operations

There are at least four ready-mixed concrete plants in Iowa. The largest is that of L. G. Everist, Inc., at Sioux City. At Clinton, the Ready Mixed Concrete, Inc., started its plant about three months ago. This company has at present only a small unit using a 2-sack Wonder mixer, which was specially designed for ready mixed concrete plants. At Mason City, the Henkel Construction Co. has entered the ready mixed concrete business but its present plant is an old paving mixer which has been mounted on the edge of a pit from which it can dump direct to trucks. The fourth operation, also small, is at Fort Dodge.

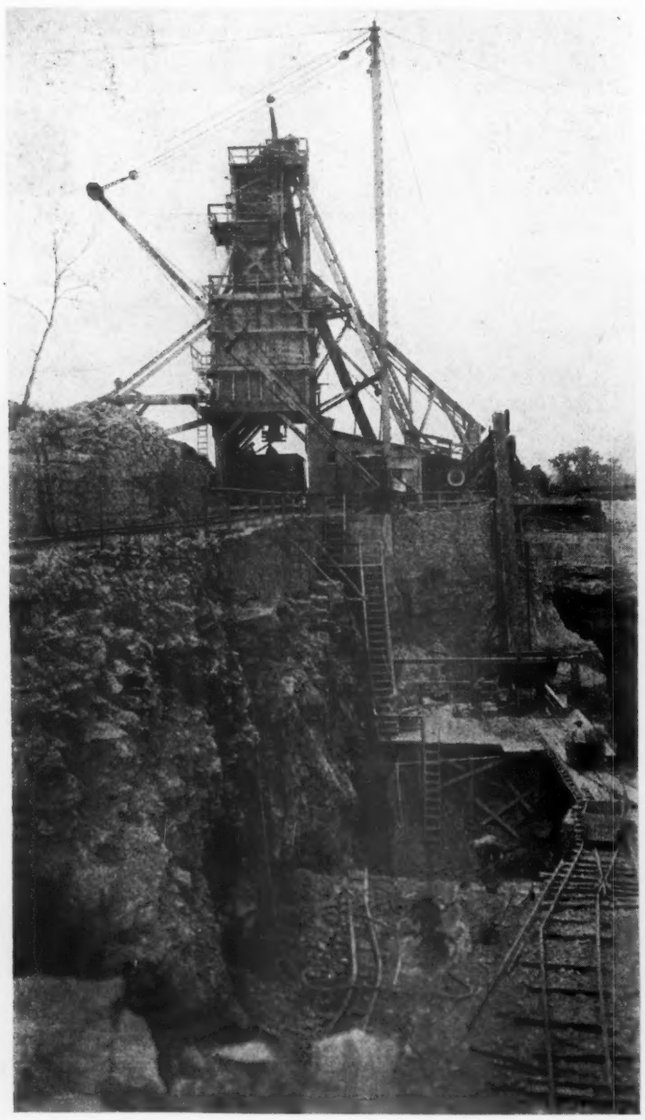


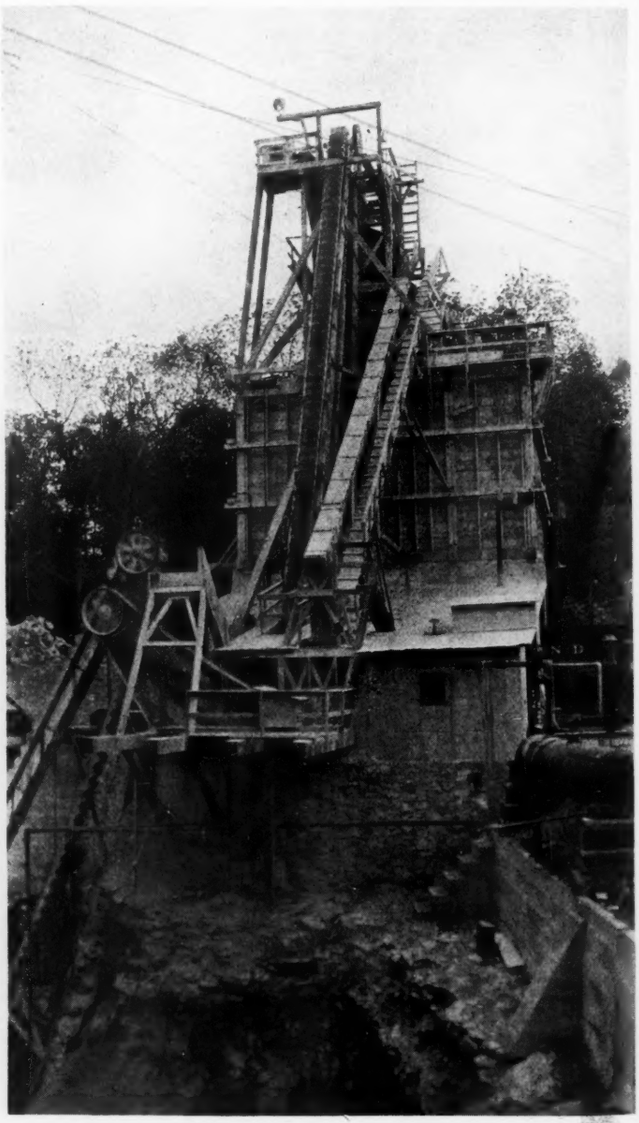
One of the rooms in the Douds mine

L. G. Everist, Inc., is the only one of the four who is also a producer of aggregates; the others are either in the ready mixed business only or connected with a contracting company or general building supply dealers. Incidentally, L. G. Everist, Inc., has at Hawarden one of the neatest and well built sand and gravel plants in the entire state, and one that would rank high in any part of the United States.

Wayside Pit Competition

Just how established producers will combat the wayside operator in Iowa is a question; possibly by becoming wayside operators themselves, having in addition to an established plant several portable units that can be shifted to the points of highway construction and play the game of the wayside





At the plant of Douds Stone Co., Douds, Ia., the stone is mostly taken from the mine, tunnels being driven into the quarry face in several places. The primary crusher is near the quarry floor

producer. A typical example of such a plant is that of the Iowa Falls Sand and Gravel Co., Iowa Falls.

This is a semi-portable plant, practically all of the equipment being furnished by the Iowa Manufacturing Co. The plant was built this year. The oversize from the rotary screen is crushed in a Western Wheel Scraper Co. crusher. This device can hardly be classed as a crusher, yet it cannot be called a hammer mill, although it resembles the latter more than any other standard crushing machine. Instead of hammers there are mullers that disintegrate the rock between the walls of the machine and the rotating mullers.

A 1-yd. Koehring gasoline shovel is used for loading to a single homemade car, that is pulled to the hopper serving the main belt conveyor, by a single-drum hoist. The plant requires a total of 110-hp., which includes 50-hp. for the pumps.

The new plant and offices are in Iowa Falls. M. O. Weaver is president, E. Weldon is vice-president, W. E. Weldon is secretary and treasurer, and F. H. Weldon is superintendent. M. O. Weaver has four portable crushed-stone plants, two road gravel plants and a portable sand washing plant in various parts of the state.

Plant and quarry of Iowa Limestone Co., Alden, Ia. The stone is in thin strata and breaks easily, showing low powder cost

Gasoline-Powered Dredge

The new dredge of the Hawkeye Materials Co., Iowa City, is of interest and indicates a use for gasoline-engine drives on larger equipment than usually considered. The pump on this Bennett dredge is driven by a 90-hp. Waukesha motor with a second engine of the same make and horsepower to drive an electric generator that supplies current for the smaller power using units on the dredge.

Plant and towboat of Hawkeye Material Co., Iowa City, Ia.

Likewise the new plant of the North Eastern Iowa sand and Gravel Co., Harpers Ferry, is another example of the use of gas-driven power. This company uses a 120-hp. Climax engine on its dragline, a McCormick-Deering gas engine on its pump and a small gas engine for driving the rotary screen and a fourth engine for driving the inclined belt conveyor. This plant was designed cooperatively by the owners of the gravel company and the Smith Engineering Works. The units are said to be very economical. Probably due to the comapratively small size of the operations using other than electric power, Diesel engines have not gained a foothold as yet.

Road Research Agency Is Proposed for Canada

ESTABLISHMENT of a central bureau of highway research was urged at the final session of the recent interprovincial conference of the Canadian Good Roads Association, according to a report received from United States Trade Commissioner Harvey A. Sweetser, Ottawa, Canada.

The office would be located at Ottawa and would provide the provinces from time to time with technical advice and with recommendations for made-in-Canada material to be used in highway construction and maintenance.

Representatives to the conference from all provinces supported this idea and expressed opinions that such a research bureau could render much assistance toward solving the problems of dust nuisance, conservation of gravel and the procuring of proper made-in-Canada road material and road machinery.

The conference was strongly of the opinion that Canadian products should be utilized wherever and whenever possible.

Researches on the Rotary Kiln in Cement Manufacture*

Part XXII—Loss in Clinker Output Due to Internal Radiation Losses from a Modern Rotary Kiln

By Geoffrey Martin

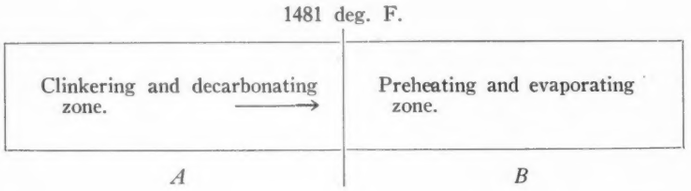
D.Sc. (London and Bristol), Ph.D., F.I.C., F.C.S., M. Inst. Chem. Eng., M. Inst. Struct. Eng., M. Soc. Pub. Analysts, F. Inst. Fuels; Chemical Engineer and Consultant; Former Director of Research of the British Portland Cement Research Association; Author of "Chemical Engineering"

Abstract

IN THIS PART of Dr. Martin's series of articles he describes the loss of high grade heat within the kiln. The external loss of high grade heat was shown in Part XXI to be an important element in causing a reduced efficiency of the rotary kiln. In this part he shows how the external losses are dwarfed by the loss of high grade heat within the kiln itself.

A table is given of calculated radiation losses from the kiln under varying conditions. At the end a second table shows comparative fuel requirements under average operating conditions, with external losses eliminated, with internal losses eliminated and with both internal and external losses eliminated. This table pictures most emphatically the importance of this loss of heat on the cost of production of clinker, and in turn the cost of cement.—The Editor.

THE LOSS OF CLINKER output from radiation inside the kiln is very much more serious than the loss due to external radiation. This is a source of loss which has been entirely neglected to date.



Let us illustrate what we mean by internal radiation.

The rotary kiln may be considered as a closed box divided into two parts, as shown in the figure.

Part *A* consists of the clinkering and CO_2 expulsion zone, while the part *B* consists of the preheating and evaporating zone. All the heat contained in *A* is of the high-grade variety, *i.e.*, is available *above* 1481 deg. F. (805 deg. C.) (because the gases and solid materials contained in *A*, as well as the walls of *A*, are all at a temperature above 1481 deg. F.), while the heat contained in *B* is of the low-grade variety (since all the gases, solid materials contained in *B*, as well as the walls of *B*, are at a temperature lower than 1481 deg. F.).

Now the part *A* is at a white heat and filling with very hot gas impregnated with fine dust, while the part *B* is comparatively cold.

Consequently there is going on continuously inside the kiln a steady radiation of heat from *A* into *B*—from a region of high temperatures to a region of lower temperatures.

But every B.t.u. thus transmitted across the dividing line between *A* and *B* represents a loss of high-grade heat, and every 918.6 B.t.u. of high-grade heat thus lost represent the loss of 1 lb. of clinker, which otherwise could be formed in *A*, as has been explained in Parts X, XV, XVI and XVIII.

So that this internal radiation loss represents a very serious diminution in the capacity of the clinkering and decarbonating zone to produce clinker, and as we will show immediately, the loss of clinker output from this course is immensely greater than the loss from the external radiation. *Indeed, this internal radiation is the main cause of the inefficiency of the modern rotary kiln.*

It is now necessary to determine the total amount of the loss. This can be done as follows:

Consider the clinkering and decarbonating zone of a kiln. In it 1 lb. of standard coal in burning combines with 10.478 lb. of air, and produces 11.278 lb. of combustion gas, by means of which the heating in the kiln takes place.

Now, if the 10.478 lb. of air were at the temperature of the atmosphere and no losses at all occurred, it has been shown in Part XIII that a flame temperature of 3769 deg. F. would be attained, the 11.278 lb. of combustion gas, in passing down the clinkering and decarbonating zone and giving up its heat to the raw material, finally escapes from the decarbonating zone at 1481 deg. F. (805 deg. C.).

This gas, in sinking from 3769 deg. to 1481 deg. F., can only *yield* 7972 B.t.u. above 1481 deg. F. (as shown in Part XV). Hence, under these conditions of *no thermal loss of any kind*, 1 lb. of standard coal can only produce 7972 B.t.u. of *high-grade* heat above 1481 deg. F., and so *this is the only amount which is available for clinker formation.*

But if the 10.478 lb. of air presented to the 1 lb. of coal be *preheated* to any given temperature *t* deg. F. *before* it is allowed to combine with the coal, and the amount of heat thus imparted to the 10.478 lb. is Q_t B.t.u. this must be added on to the 7972 B.t.u., which thus became available for clinker formation. This was explained in Parts XVII and XX, which the reader is recommended to peruse once again to refresh his memory.

Hence the net result is this:

If no thermal loss of any kind occurs in clinkering and decarbonating zone, there is available for 1 *lb. of coal for clinker formation* 7972 *B.t.u. of high-grade heat due to the heat from the coal, together with* Q_t *B.t.u. due to the heat already contained in the* 10.478 *lb. of hot air which is preheated to a temperature t deg. above that of the atmosphere* (60 *deg. F.*).

I.e., if Q_{max} be the total available high-grade heat in the clinkering and decarbonating zone, and it be then contained in 10.478 lb. of entering air—

$$\text{10.478 lb. of entering air} \cdot Q_{max.} = 7972 + Q_t \quad . \quad . \quad . \quad . \quad (1)$$

But this total amount of high-grade heat developed in the clinkering and decarbonating zone must supply the following losses:

(*a*) The heat required to expel the CO_2 from the carbonate, at 1481 deg. F. (805

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deg. C.), and form the clinker and raise the mass to the clinkering temperature

$$= (7972 + \text{B.t.u. in preheated air}) = \left\{\begin{matrix}\text{Weight of clinker}\\ \text{formed per 1 lb.}\\ \text{of coal}\end{matrix}\right\} \times 918.6;$$

of 2500 deg. F. In Part X this amount of heat was shown to equal 918.6 B.t.u. per 1 lb. of *clinker formed.*

(*b*) The heat radiated externally from the clinkering and decarbonating zone per 1 lb. of standard coal burnt, let us call this R. This has been shown in Part XXI to amount to 469 B.t.u. per 1 lb. of standard coal burnt (of 12,600 B.t.u. per lb.).

(*c*) The heat radiated from the clinkering and decarbonating zone to the lower part of the zone. This has to be determined. Let it be R_I B.t.u. per 1 lb. of standard coal burnt in the kiln.

Then we have the following equation to determine this internal radiation:

External radiation loss from clinkering and decarbonating zone per 1 lb. of standard coal burnt $= R_E$.

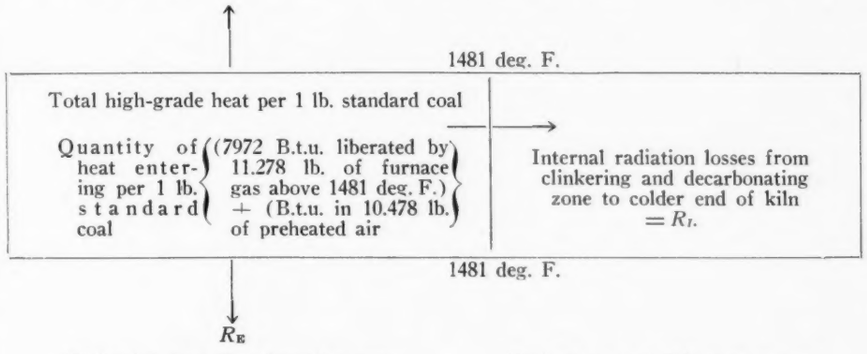

1481 deg. F.
Total high-grade heat per 1 lb. standard coal
Quantity of heat entering per 1 lb. standard coal
(7972 B.t.u. liberated by 11.278 lb. of furnace gas above 1481 deg. F.) + (B.t.u. in 10.478 lb. of preheated air
Internal radiation losses from clinkering and decarbonating zone to colder end of kiln = R_I.
1481 deg. F.
R_E
Clinkering and decarbonating zone.
Preheating and dehydrating zone.

Diagram illustrating the equation:

Total high-grade heat	=	Internal radiation loss	+	External radiation loss	+	Heat absorbed in clinker formation
$7972+Q_t =$		R_I	+	R_E	+	$918.6W$

$$7972 + \left\{\begin{matrix}\text{B.t.u. in preheated}\\ \text{10.478 lb. of air}\end{matrix}\right\} = \text{B.t.u. absorbed in forming the clinker}$$
$$+ \text{ external radiation from clinkering and decarbonating zone per 1 lb. of coal burnt}$$
$$+ \text{ internal radiation for clinkering and decarbonating zone per 1 lb. of coal burnt;}$$

or, in symbols, if W = lb. of clinker formed per 1 lb. of coal—

$$7972 + Q_t = W \times 918.6 + R_E + R_I \quad (1)$$

whence

$$R_I + R_E = 7972 + Q_t - W \times 918.6 \quad (2)$$

All these quantities are known in a modern kiln, so that it is possible to calculate the loss of internal radiation R_I in a given clinker output.

As the external radiation from the clinkering and decarbonating zone varies for different kilns, we will first calculate the total radiation loss with any given output, their total radiation losses embracing both the internal and external losses.

From the preceding relationship we find:

internal radiation + external radiation per 1 lb. of standard coal burnt

$$= \left\{\begin{matrix}\text{Weight of clinker}\\ \text{formed per 1 lb.}\\ \text{of coal}\end{matrix}\right\} \times 918.6;$$

or

$$R_E + R_I = (7972 + Q_t) - W \times 918.6 \quad (3)$$

The accompanying table is a calculation of the total radiation losses.

The value of Q_t (the heat contained in the 10.478 lb. of preheated air necessary for 1 lb. of coal burnt) is calculated for different temperatures in Part XIII, Table I.

The values of the heat absorbed in forming different weights of clinker ($W \times 918.6$ B.t.u. per W lb. clinker formed) are calculated in Part XV, Table I, column (2), the corresponding amount of clinker producible being given in column (3) of the same table.

In a perfect kiln this quantity of heat is for combustion is preheated to different temperatures t deg. C.

From the values of Q_tW and $918.6W$ contained in the above-mentioned table, the accompanying Table I is calculated.

It gives the values of the sum of the losses of *high-grade heat, i.e.,* B.t.u.'s available *above* 1481 deg. F. (805 deg. C.) per 1 lb. of standard coal burnt (of 12,600 B.t.u. per lb.) which occur in any given cement kiln with a given output.

This table is calculated from the formula:

$$R_I + R_E = 7972 + Q_t - W \times 918.6.$$

Where
- R_I = *internal radiation* loss from clinkering and decarbonating zone into preheating and dehydrating zone, expressed in B.t.u.'s per 1 lb. of standard coal consumed in the furnace.
- R_E = *external radiation loss* from the clinkering and decarbonating zone into the air expressed in B.t.u.'s per 1 lb. of coal burnt.
- Q_t = B.t.u.'s brought into furnace by 10.478 lb. of the preheated air.
- W = lb. of clinker produced per 1 lb. of standard coal burnt in the furnace.

Remarks on Table

Table I shows the gradual increase in the radiation losses as the kiln falls away from what is theoretically possible. The perfect kiln working with air preheated to 2500 deg. F. (the clinkering temperature) and producing 100 tons of clinker per 6.356 tons of standard coal burnt (or 15.732 lb. of clinker per 1 lb. of coal burnt) shows no internal or external losses.

As we go down the scale and come to the very imperfect kilns now used in actual practice, we see the internal radiation losses become perfectly enormous.

E.g., a kiln producing 100 tons of clinker per 30.120 tons of coal has the enormous radiation loss of 4922 B.t.u. per 1 lb. of standard coal burnt when the air is not preheated at all, while if the air is preheated to 400 deg. F. the loss is as great as 5750 B.t.u. per 1 lb. of standard coal burnt.

From this table we are now able to calculate the loss of clinker output due to internal radiation from any given rotary kiln, provided we know its output of clinker per 1 lb. of standard coal (12,600 B.t.u. per lb.) burnt and the external radiation losses from the clinkering and decarbonating zone.

Suppose, for example, a given cement rotary kiln is yielding 100 tons of clinker per 30.120 tons of standard coal burnt. This is the same as 3.320 lb. of clinker per 1 lb. of standard coal burnt.

Let us suppose also that the entering air is preheated to 400 deg. F., which is the normal condition of the air entering most rotary kilns.

Then Q_t = B.t.u. required to heat 10.478 lb. of air from 60 deg. to 400 deg. F.
= 828 B.t.u. (Table I, Part XIII).

$918.6\,W$ = heat absorbed in forming the clinker
$= 918.6 \times 3.320$
$= 3050$ B.t.u.

Whence from equation (3)

$R_E + R_I$ = total radiation losses
$= 7972 + 828 - 3050$
$= 5750$ B.t.u. per 1 lb. of standard coal burnt.

Also in Part XXI it is shown that for an average modern rotary kiln the external radiation R_E from the decarbonating and clinkering zone is, say, 469 B.t.u.

Therefore: The internal radiation loss is $R_I = 5750 - 469 = 5281$ B.t.u. per 1 lb. of standard coal.

This represents a loss of high-grade heat made *useless* for clinker production by being

TABLE I

SHOWING COMBINED INTERNAL AND EXTERNAL RADIATION LOSSES FROM THE CLINKERING AND DECARBONATING ZONE INTO THE PREHEATING AND DEHYDRATING ZONE, AND INTO THE EXTERNAL ATMOSPHERE, EXPRESSED IN B.T.U. PER 1 LB. OF STANDARD COAL (OF 12,600 B.T.U.) BURNED IN THE CEMENT ROTARY KILN

(1) Clinker production in kiln		(2) Temperature of entering air, t deg. F.	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Tons standard coal consumed per 100 tons of clinker produced	Lb. of clinker produced per 1 lb. standard coal burned		60 deg. F.	100 deg. F.	200 deg. F.	300 deg. F.	400 deg. F.	500 deg. F.	600 deg. F.	700 deg. F.	800 deg. F.	900 deg. F.	1000 deg F.	1500 deg. F.	2000 deg. F.	2500 deg. F.
		Quantity of heat in 10.478 lb. of pre-heated air Q_t	B.t.u. 0	B.t.u. 96.5	B.t.u. 338	B.t.u. 582	B.t.u. 828	B.t.u. 1,076	B.t.u. 1,327	B.t.u. 1,579	B.t.u. 1,834	B.t.u. 2,090	B.t.u. 2,349	B.t.u. 3,673	B.t.u. 5,050	B.t.u. 6,479
6.356	15.732	$R_E + R_I$*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.488	15.414	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	0	291
6.622	15.102	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	0	578
6.760	14.793	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	0	862
6.904	14.485	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	0	1,145
7.054	14.177	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	0	1,428
7.208	13.873	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	278	1,707
7.367	13.575	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	552	1,981
7.535	13.271	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	831	2,260
7.709	12.972	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	1,107	2,536
7.889	12.675	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	0	1,376	2,808
8.074	12.386	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	267	1,644	3,073
8.269	12.094	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	535	1,912	3,341
8.470	11.806	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	800	2,177	3,606
8.679	11.522	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	1,061	2,438	3,867
8.898	11.239	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	0	1,321	2,698	4,127
9.129	10.954	$R_E + R_I$	0	0	0	0	0	0	0	0	0	0	259	1,583	2,960	4,389
9.368	10.675	$R_E + R_I$	0	0	0	0	0	0	0	0	0	256	515	1,839	3,216	4,645
9.618	10.397	$R_E + R_I$	0	0	0	0	0	0	0	0	255	511	770	2,094	3,471	4,900
9.876	10.125	$R_E + R_I$	0	0	0	0	0	0	0	250	505	761	1,020	2,344	3,721	5,150
10.153	9.850	$R_E + R_I$	0	0	0	0	0	0	251	503	758	1,014	1,273	2,597	3,974	5,403
10.438	9.580	$R_E + R_I$	0	0	0	0	0	248	499	751	1,006	1,262	1,521	2,845	4,222	5,651
10.740	9.311	$R_E + R_I$	0	0	0	0	247	495	746	998	1,256	1,509	1,768	3,092	4,469	5,898
11.056	9.045	$R_E + R_I$	0	0	0	245	491	739	990	1,242	1,497	1,753	2,012	3,336	4,713	6,142
11.383	8.785	$R_E + R_I$	0	0	240	484	730	978	1,229	1,481	1,736	1,992	2,251	3,575	4,952	6,381
11.521	8.680	$R_E + R_I$	0	96.5	338	582	828	1,076	1,327	1,579	1,834	2,090	2,349	3,673	5,050	6,479
11.893	8.408	$R_E + R_I$	254	350.5	592	836	1,082	1,330	1,581	1,833	2,088	2,344	2,603	3,927	5,304	6,733
12.525	7.984	$R_E + R_I$	638	734.5	976	1,220	1,466	1,714	1,965	2,217	2,472	2,728	2,987	4,311	5,688	7,117
13.210	7.570	$R_E + R_I$	1,018	1,114.5	1,356	1,600	1,846	2,094	2,345	2,597	2,852	3,108	3,367	4,691	6,068	7,497
13.957	7.165	$R_E + R_I$	1,390	1,486.5	1,728	1,972	2,218	2,466	2,717	2,969	3,224	3,480	3,739	5,063	6,440	7,869
14.791	6.761	$R_E + R_I$	1,762	1,858.5	2,100	2,344	2,590	2,838	3,089	3,341	3,596	3,852	4,111	5,435	6,812	8,241
15.726	6.359	$R_E + R_I$	2,131	2,227.5	2,469	2,713	2,959	3,207	3,458	3,710	3,965	4,221	4,480	5,804	7,181	8,610
16.770	5.963	$R_E + R_I$	2,494	2,590.5	2,832	3,076	3,322	3,570	3,821	4,073	4,328	4,584	4,843	6,167	7,544	8,973
17.960	5.568	$R_E + R_I$	2,857	2,953.5	3,195	3,439	3,685	3,933	4,184	4,436	4,691	4,947	5,206	6,530	7,907	9,336
19.301	5.181	$R_E + R_I$	3,213	3,309.5	3,551	3,795	4,041	4,289	4,540	4,792	5,047	5,303	5,562	6,886	8,263	9,692
20.855	4.795	$R_E + R_I$	3,567	3,663.5	3,905	4,149	4,395	4,643	4,894	5,146	5,401	5,657	5,916	7,240	8,617	10,046
22.660	4.413	$R_E + R_I$	3,919	4,015.5	4,257	4,501	4,747	4,995	5,246	5,498	5,753	6,009	6,268	7,592	8,969	10,398
24.801	4.030	$R_E + R_I$	4,268	4,364.5	4,606	4,850	5,096	5,344	5,595	5,847	6,102	6,358	6,617	7,941	9,318	10,747
25.044	3.993	$R_E + R_I$	4,304	4,400.5	4,642	4,886	5,132	5,380	5,631	5,883	6,138	6,394	6,653	7,977	9,354	10,783
25.278	3.956	$R_E + R_I$	4,338	4,434.5	4,676	4,920	5,166	5,414	5,665	5,917	6,172	6,428	6,687	8,011	8,388	10,817
25.517	3.919	$R_E + R_I$	4,372	4,468.5	4,710	4,954	5,200	5,448	5,699	5,951	6,206	6,462	6,721	8,045	9,422	10,851
25.760	3.882	$R_E + R_I$	4,406	4,502.5	4,744	4,988	5,234	5,482	5,733	5,985	6,240	6,496	6,755	8,079	9,456	10,885
26.021	3.843	$R_E + R_I$	4,442	4,538.5	4,780	5,024	5,270	5,518	5,769	6,021	6,276	6,532	6,791	8,115	9,492	10,921
26.274	3.806	$R_E + R_I$	4,476	4,572.5	4,814	5,058	5,304	5,552	5,803	6,055	6,310	6,566	6,825	8,149	9,526	10,955
26.532	3.760	$R_E + R_I$	4,510	4,606.5	4,848	5,092	5,330	5,586	5,837	6,089	6,344	6,600	6,859	8,183	9,560	10,989
26.802	3.731	$R_E + R_I$	4,545	4,641.5	4,883	5,127	5,373	5,621	5,872	6,124	6,379	6,635	6,894	8,218	9,595	11,024
27.078	3.693	$R_E + R_I$	4,580	4,676.5	4,918	5,162	5,408	5,656	5,907	6,159	6,414	6,670	6,929	8,253	9,630	11,059
27.352	3.656	$R_E + R_I$	4,614	4,710.5	4,952	5,196	5,442	5,690	5,941	6,193	6,448	6,704	6,963	8,287	9,664	11,093
27.632	3.619	$R_E + R_I$	4,648	4,744.5	4,986	5,230	5,476	5,724	5,975	6,227	6,482	6,738	6,997	8,321	9,698	11,127
27.917	3.582	$R_E + R_I$	4,682	4,778.5	5,020	5,264	5,510	5,758	6,009	6,261	6,516	6,772	7,031	8,355	9,732	11,161
28.209	3.545	$R_E + R_I$	4,716	4,812.5	5,034	5,298	5,544	5,792	6,043	6,295	6,550	6,806	7,065	8,389	9,766	11,195
28.514	3.507	$R_E + R_I$	4,751	4,847.5	5,089	5,333	5,571	5,827	6,078	6,330	6,585	6,841	7,100	8,424	9,801	11,230
28.827	3.469	$R_E + R_I$	4,785	4,881.5	5,123	5,367	5,613	5,861	6,112	6,364	6,619	6,875	7,134	8,458	9,835	11,264
29.137	3.432	$R_E + R_I$	4,819	4,915.5	5,157	5,401	5,647	5,895	6,146	6,398	6,653	6,909	7,168	8,492	9,869	11,298
29.455	3.395	$R_E + R_I$	4,853	4,949.5	5,191	5,435	5,681	5,929	6,180	6,432	6,687	6,943	7,202	8,526	9,903	11,332
29.771	3.359	$R_E + R_I$	4,887	4,983.5	5,225	5,469	5,715	5,963	6,214	6,466	6,721	6,977	7,236	8,560	9,937	11,376
30.120	3.320	$R_E + R_I$	4,922	5,018.5	5,260	5,504	5,750	5,998	6,249	6,501	6,756	7,012	7,271	8,595	9,972	11,401
30.460	3.283	$R_E + R_I$	4,956	5,052.5	5,294	5,538	5,784	6,032	6,283	6,535	6,790	7,046	7,305	8,629	10,006	11,435
34.305	2.915	$R_E + R_I$	5,295	5,391.5	5,633	5,877	6,123	6,371	6,622	6,874	7,129	7,385	7,644	8,968	10,345	11,774
39.246	2.549	$R_E + R_I$	5,631	5,727.5	5,969	6,213	6,459	6,707	6,958	7,210	7,465	7,721	7,980	9,304	10,681	12,110
45.766	2.185	$R_E + R_I$	5,965	6,061.5	6,303	6,547	6,793	7,041	7,292	7,544	7,799	8,055	8,314	9,638	11,015	12,444
54.824	1.824	$R_E + R_I$	6,296	6,392.5	6,634	6,878	7,124	7,372	7,623	7,875	8,130	8,386	8,645	9,969	11,346	12,775
70.126	1.466	$R_E + R_I$	6,625	6,721.5	6,963	7,207	7,453	7,701	7,952	8,204	8,459	8,715	8,974	10,298	11,675	13,104
90.000	1.111	$R_E + R_I$	6,951	7,047.5	7,289	7,533	7,779	8,027	8,278	8,530	8,785	9,041	9,300	10,624	12,001	13,430
131.575	0.760	$R_E + R_I$	7,274	7,370.5	7,612	7,856	8,102	8,350	8,601	8,853	9,108	9,364	9,623	10,947	12,324	13,753
243.309	0.411	$R_E + R_I$	7,594	7,690.5	7,932	8,176	8,422	8,670	8,921	9,173	9,428	9,684	9,943	11,267	12,644	14,073
1,538.461	0.065	$R_E + R_I$	7,912	8,008.5	8,250	8,494	8,740	8,988	9,239	9,491	9,746	10,002	10,261	11,585	12,962	14,391
	0.000	$R_E + R_I$	7,972	8,068.5	8,310	8,554	8,800	9,048	9,299	9,551	9,806	10,062	10,321	11,645	13,022	14,451

*Total Radiation.

transformed into the low-grade variety by radiation.

The loss of clinker output thus occasioned is enormous.

Therefore: Since every 918.6 B.t.u. of high-grade heat loss represents the loss of 1 lb. of clinker, the loss due to 5281 B.t.u. is

$$\frac{5281}{918.6} = 5.75 \text{ lb. per 1 lb. of standard coal burnt.}$$

In our present case 30.21 lb. of coal produce 100 lb. of clinker.

Therefore: On each 1 lb. of coal there is a loss in output of 5.75 lb. of clinker.

Therefore: On 30.21 lb. of coal there is a loss of $30.21 \times 5.75 = 174$ lb. of clinker.

Therefore: If *no* internal radiation losses occurred, 30.21 lb. of standard coal burnt would produce $174 + 100 = 274$ lb. of clinker, or 100 lb. of clinker would be produced by the expenditure of

$$\frac{30.21}{274} \times 100 = 11.0 \text{ lb. of coal.}$$

In other words, the internal radiation prevailing inside a kiln normally producing 100 *tons of clinker for* 30.21 *tons of standard coal of* 12,600 *B.t.u. per* 1 *lb. is responsible for increasing its coal consumption from* 11 *to* 30.21 *tons of standard coal per* 100 *tons of clinker produced.*

Internal Radiation Is Main Factor in Reducing Efficiency

The internal radiation prevailing inside a cement rotary kiln is therefore the *main factor in reducing the efficiency of the rotary kiln.*

It is a far more effective factor than the exernal radiation, which, as we have seen in Part XXI, is responsible for increasing its coal consumption from *26 to 30 tons of standard coal per 100 tons clinker produced.*

The *combined* external and internal *radiation* amount to 5750 B.t.u. per 1 lb. of coal burnt in the case of the kiln previously considered (*i.e.,* burning 30.120 tons of *coal* per 100 tons* of clinker).

This total radiation means a loss of

$$\frac{5750}{918.6} = 6.26 \text{ lb. of clinker per 1 lb. of coal.}$$

Therefore: The *loss* on 30.12 lb. of coal is $30.12 \times 6.26 = 189$ lb. of clinker.

Hence 30.12 tons* of coal should be producing $100 + 189 = 289$ tons* of clinker, or 100 tons* of clinker would be produced by the expenditure of

$$\frac{30.12 \times 100}{289} = 10.4 \text{ tons* of } coal.$$

So the abolition of all radiation losses would reduce the fuel consumption of the kiln per 100 tons of clinker from 30.12 to only 10.4 tons of standard coal.

The following Table II has been calculated in the above manner for different clinker outputs.

The table brings out the enormous losses which occur in the kiln due to radiation losses, and especially illustrates how much more serious are the internal radiation losses than the external.

Column (1) shows the fuel consumption of a rotary kiln expressed in tons of standard coal per 100 tons of clinker.

Column (2) shows what this fuel consumption would drop to if, by suitable insulation, all external radiation losses were completely stopped from the clinkering and decarbonating zone, but the internal radiation losses were left unchecked.

Column (3) shows what the fuel consumption would drop to if the *internal* radiation losses from the clinkering and decarbonating zone were completely stopped, but the external radiation losses were left unaltered.

Column (4) shows what the fuel consumption would become if both the internal and external radiation losses from the kiln were completely stopped.

TABLE II. SHOWING THE EFFECT ON FUEL CONSUMPTION OF STOPPING THE RADIATION LOSSES FROM CEMENT KILNS

(Tons of standard coal consumed per 100 tons of clinker made)

(1) Clinker output from kiln	(2) Effect of stopping external radiation from clinkering and decarbonating zone, but keeping internal radiation unaltered	(3 Internal radiation from clinkering and decarbonating zone stopped, but external radiation unaltered	(4) Both internal and external radiations stopped in clinkering and decarbonating zone
20.855	18.86	11.02	10.44
25.044	22.22	11.02	10.44
26.021	22.97	11.02	10.44
27.078	23.79	11.02	10.44
28.209	24.73	11.02	10.44
29.137	25.36	11.02	10.44
30.120	26.11	11.02	10.44
34.305	29.19	11.02	10.44
39.246	32.70	11.02	10.44

Conclusions

(1) The radiation losses from the clinkering and decarbonating zone are extremely serious in increasing the coal consumption per 100 tons of clinker produced, the internal radiation losses being very much more deleterious than the external radiation losses in this respect.

(2) The main cause of the thermal inefficiency of the rotary kiln is the enormous radiation losses. It is these losses alone which render the wet process economically possible.

(3) In order to secure kiln economy, the main line of progress for kiln designers lies in concentrating all efforts on eliminating as far as possible all internal and external radiation losses.

Everything else exerts quite a subsidiary influence on kiln economy.

(To be continued)

*British tons of 2240 lb. To convert to American net tons multiply by 1.12.

Physical Properties of Slate

A TABULATION of physical test data on slate, covering samples tested at this bureau during the past 10 years, is being made for a publication of the U. S. Bureau of Standards. Data are available on 338 samples from 12 districts.

Strength in flexure has been determined mainly across the grain on specimens in the dry state. The values of the modulus of rupture vary from 4000 to 16,500 lb./in.^{2}. An average of 1287 tests regardless of grain direction for fresh slate gave a value of 10,400. lb./in.^{2}. A comparison of 174 flexural strength determinations, in which half of the specimens were broken across the grain and the others along the grain, indicates that the material is only about 65% as strong when broken in the grain direction. However, there appears to be a considerable variation in this relation for slates from different districts, some being almost as strong in one direction as the other, while others are less than half as strong in the grain direction as perpendicular to it.

Elasticity determinations have been made on 220 samples and the average of 550 individual tests gave a modulus value, $E = 13{,}250{,}000$.

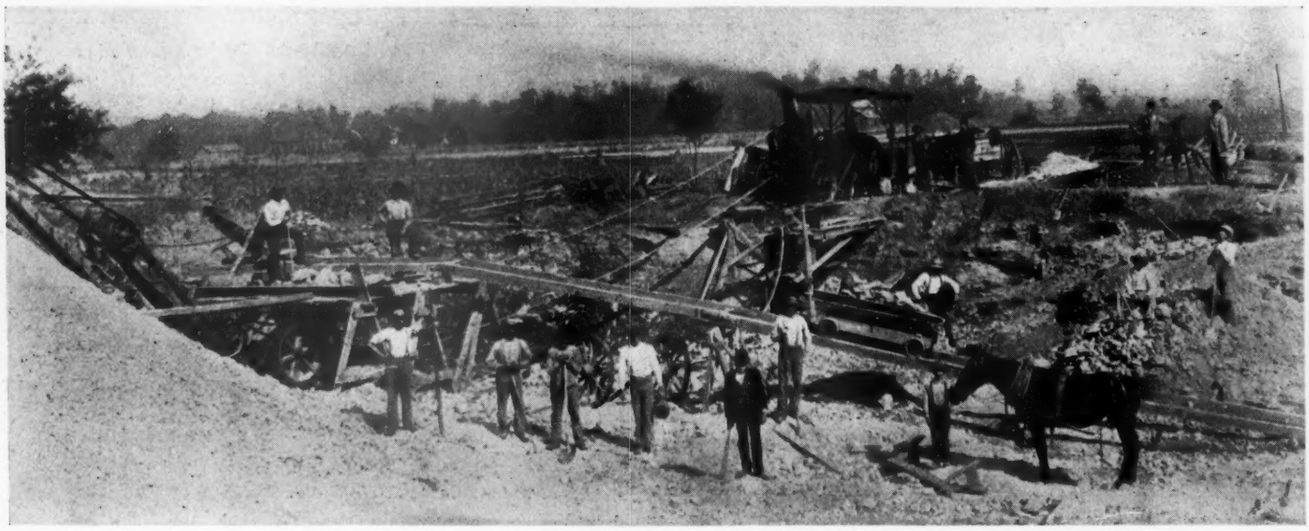
The maximum bend of a slate 3/16 in. thick, when supported along two lines 16 in. apart and loaded at the mid-point to failure, has been considered as a measure of the toughness. This is computed from the modulus of rupture and modulus of elasticity values, and the average of 200 tests across the grain on dry specimens gives a value of 0.186 in. The range in toughness values was from 0.090 to 0.263 in.

Absorption values show a range of from 0.01 to slightly over 1% on freshly quarried slate, with an average for 1287 tests of 0.26%.

Values for the apparent specific gravity of the slates range from 2.74 to 2.89, which correspond to unit weights of 171 to 181 lb. per cu. ft. for slate in the dry condition.

Attempts to determine the porosity of slate have not been satisfactory, apparently because of difficulties in getting accurate values for the true specific gravity. Absorption tests indicate apparent porosity values ranging from 0.03 to 2.8%.

Weathering tests have embraced freezing and thawing, soaking and drying and acid tests. The freezing tests have indicated that frost plays only a minor part in slate weathering, as 2000 cycles of the freezing test usually do not show more than a thin scaling of the surface layers. Soaking and drying tests produce decay similar to that found in actual weathering, and 40 or 50 cycles produce measurable strength losses or complete decay of the less resistant slates. Seven days immersion of slate in a 1% H_2SO_4 bath seems to offer a convenient means of discrimination between the better and poorer weathering slates.



Original operation of Laura Gravel and Stone Co., near Clayton, Ohio

"Then and Now"

Clever Bit of Publicity by Ohio Crushed Stone Producer

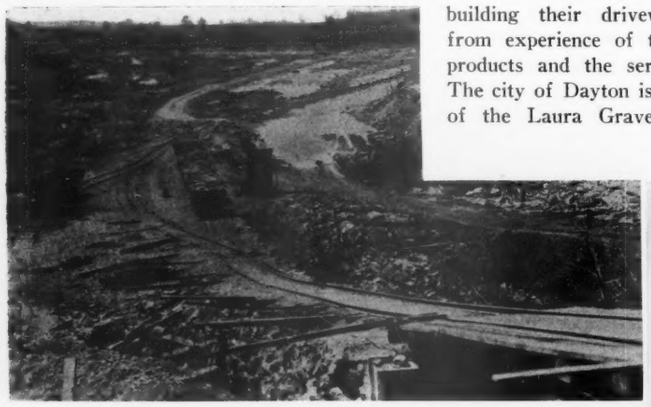
THE *Dayton* (Ohio) *Journal* recently carried two pictures and a "story" which so interested us that we sent for the photographs. The story reads as follows:

"The pictures here show the growth in the Laura Gravel and Stone Co., located between Clayton and Phillipsburg. The old-time picture was taken back in 1890 and shows the limited extent of the 'diggings' in that period, together with the old mule-drawn equipment for transporting the stone out of the pit. Today, these quarries are equipped as well as any in this section and have become, under the direction of I. E. Baker, the manager, perhaps one of the largest quarries in the state. The greatest demand from the concern is for crushed stone for roads and driveways. Many Dayton homes, business firms and institutions get crushed stone from the Laura firm for building their driveways, having learned from experience of the superiority of the products and the service of the company. The city of Dayton is also a large customer of the Laura Gravel and Stone Co., as well as towns, villages, counties and townships throughout this section. The Laura Gravel and Stone Co. is, in addition, supplying a great deal of agriculutral limestone to farmers of this section."

Old Memories Revived

This is a splendid bit of publicity work. Nearly every editor is interested in "Then and Now" pictures. They have a real appeal to readers, especially to those whose memories "go away back when"—and such readers are usually substantial citizens.

Incidentally, these pictures tell a real story of the development of the crushed-stone industry. This plant of the Laura Gravel and Stone Co. was described in detail in Rock Products, October 25, 1930.



Quarry and plant as they appear at the present time

Classification of and Specifications for Siliceous Sands

IN AN ARTICLE by Ralph Tuck which appeared in *Economic Geology* he describes sand as "an aggregate of unconsolidated or loosely coherent minerals or rock fragments that range in size from 1/500- to ⅛-in." He says that because sands vary so much, and because they are found in most localities, definite specifications are not found for specific uses of the material. Economy seems to result in using local material in most cases, at the sacrifice of desirable properties.

An important basis of present specifications is size, and much confusion is caused here by the fact that no uniform series of sieves are used, and those employed are not always carefully calibrated.

Properties upon which the use of sand depends are: The presence or absence of clay, mineralogic composition of the sand, purity, size of grain, distributed grading, uniformity of grain size, and the angularity of individual grains.

At present the uniformity of grain size and clay content seem to be the most common properties appearing in specifications, and therefore are used as the means of classifying sands as to their uses. A classification of siliceous sands indicating uses on the basis of their properties and also giving specifications for different uses is presented. The author says it should be understood specifications for sands differ, and those given are generalized and in some cases idealized.

Classification of and Specification for Siliceous Sands

A. NO CLAY PRESENT

(1) *GRAINS UNIFORM IN SIZE (ASSUMING 90% APPROACH SPECIFIED SIZE).*

Filter sand—Uniform size, either round or angular grains, free from clay, and organic matter, not more than 5% soluble in hydrochloric acid (HCl). Typical sand has at least 90% finer than 1 mm. and not more than 1% finer than 2 mm. Effective size 10% (wt.) finer and 90% coarser than 0.25 to 0.50 mm. Uniformity coefficient 1.5 (size of grain having 60% finer than this size to size having 10% finer). Exactly uniform sand has a coefficient of 1.0.

Glass sand—Uniform size, 20-100 mesh, 95% silica, iron 0.02 to 1.0% depending on type of glass, aluminum 0.1 to 4%. No coarse grains allowable, sharp grains preferred.

Sand blast—Uniform size 4 to 48 mesh, free of clay and few cleavable grains. Rounded grains are more durable while angular grains cut faster.

Editor's Note

THIS ABSTRACT contains in the fewest possible words the most information about Sand Requirements for various uses that it has ever been our privilege to publish. We are sure it will be worth the while of every sand producer to read it and to save it for future reference.—The Editor.

Stone sawyers' sand—Sharp and uniform grain, flat grains are useless. Must pass 20 mesh and be retained on 60 mesh.

Grinding and polishing—Uniform and free of coarse grains. For polishing glass sand should pass 20 mesh. Size depends entirely upon use.

Carborundum manufacture—Even grains of 99% silica, all retained on 150 mash.

Potters sand—(1) Fine, 28 to 100 mesh. (2) Coarse, 10 to 40 mesh. Free of dust, fairly well sized. For light colored ware sand should be low in irons and fluxes.

(2) *GRAINS MAY OR MAY NOT BE UNIFORM IN SIZE*

Chemical and metallurgical use—Approach glass sands in purity. Iron, aluminum, lime, magnesium and phosphorus may be present in minute quantities.

Sand for pulverizing—Must be of pure, high quality silica. It is used for abrasives, paint filler, ground silica, etc. Use determines degree of fineness to which sand is ground.

Traction sand—Prefer 95% silica sand free of moisture holding material. Angular grain preferred. Should pass 20 mesh and be retained on 80 mesh screen.

Sand-oil roads—Sand should be sharp and well graded with well distributed sizes.

Stucco sand—100% should pass a 4-mesh and not more than 5% pass 100-mesh screen. Should be clean and free of clay and silt.

Roofing sand—White, dustless sand with grain size all between 20 and 100 mesh.

(3) *GRAINS NOT UNIFORM IN SIZE.*

Sand-lime brick—80% silica with not over 2% clay, of various sizes, but all passing 20 mesh screen.

Asphalt pavement and flooring sands—Free of clay and silt, clean, sharp, with small per cent. of voids. Grain size well distributed. Not over 5% passing the 200 mesh screen and 1% or less retained on the 10 mesh.

Cushion sand (sub-grade sands)—Some clay may be present, all should pass ¼-in. screen and at least 40% be retained on 10 mesh.

B. CLAY MAY OR MAY NOT BE PRESENT—IF PRESENT, IN LIMITED OR SPECIFIED AMOUNTS

(1) *NON-UNIFORM IN GRAIN SIZE.*

Brick mortar sands—All must pass 10 mesh and 80% must be retained on 100 mesh. Must contain no organic matter and not over 3% clay.

Concrete sands—Must contain little or no organic matter and not over 3% clay by weight. It is important that grain sizes be well distributed. The following is recommended:

Passing ¼-in. screen	95-100%
Passing 50-mesh screen	5- 30%
Passing 100-mesh screen	0- 8%

Stone masonry mortar—Clean sand and even grain size, all to pass ¼-in. screen. The size will vary with the thickness of the coat of mortar.

Fire or furnace—Shall have lime or clay binder with high fusion point; 97% or more shall be silica and a good grain distribution is required.

Core—Medium grain sizes are required, with good distribution; 97% or more shall be silica. Small amounts of clay are permissible and artificial binder that will be destroyed may be added.

Plaster—All shall pass 10 mesh screen and 80% shall be retained on the 50-mesh. No organic material or soluble salts are permissible, though a maximum of 5% of clay is allowed. Sea sands may not be used.

Railroad ballast—90% shall be retained on the 12 mesh screen.

Sand-lime brick—(see A-3).

Cushion sand (see A-3).

C. CLAY PRESENT: NON-UNIFORM GRAIN

Sand-clay road—70-90% coarse grained and angular, the balance of clay. Sand shall all pass ¼-in. screen and 45 to 60% shall be retained on 60 mesh; 5 to 20% of silt is allowed and 10 to 25% of clay.

Foundry Sand—Depends on type of casting. Should have from 2 to 20% bond, various permeability, a good distribution of grain size. The durability depends upon the refractoriness of the bond.

A British Cement Idea

A BRITISH PATENT, *332,322,* was given F. S. Watt pertaining to the manufacture of portland cement. A fine spray of slurry is caused to pass through the hottest part of the flame in a kiln to produce a clinker in a fine state of subdivision.—*Chemical Abstracts.*

Air Receiver Installation and Care

By Walter B. Lenhart
Associate Editor, Rock Products

THE CAUSES of air receiver explosions, which have often resulted in loss of life and property, have been attributed to a variety of conditions. After thorough study and investigation of such explosions and their causes the writer has analyzed the conditions under which explosions may occur, and in this article describes those conditions and suggests methods of eliminating them.

Causes of Explosions

Explosions may be attributed to (1) an accumulation or occurrence of explosive dusts or gases which become ignited from various sources, and (2) failure of the safety valve to function.

An accumulation or occurrence of an explosive gas may result from the decomposition of the oil used for lubricating the compressor. This oil may decompose at low temperature if the oil is of poor quality or has a low flash point, or at a higher temperature if it has a high flash point. This decomposition may give rise to a gaseous mixture which will explode if ignited. One of the products of decomposition of the oil is acetylene ($H_2C:C$). Another is carbon.

Gas acetylene has been found to explode spontaneously at pressures of less than 50 lb. per sq. in., which is a pressure not uncommon in the operation of air compressors. While acetylene used for welding is compressed to much higher pressures, it is dissolved in acetone, and in this form loses its property of spontaneously exploding. Acetylene has a specific density of about 0.62 compared with air of 1.0. It is thus possible a light gas of this nature might accumulate at any high non-air-swept portion of an air receiver. Conversely, if entrance and exit were both at the top of the container heavy gases or oils could accumulate, so as to be constantly subject to ignition.

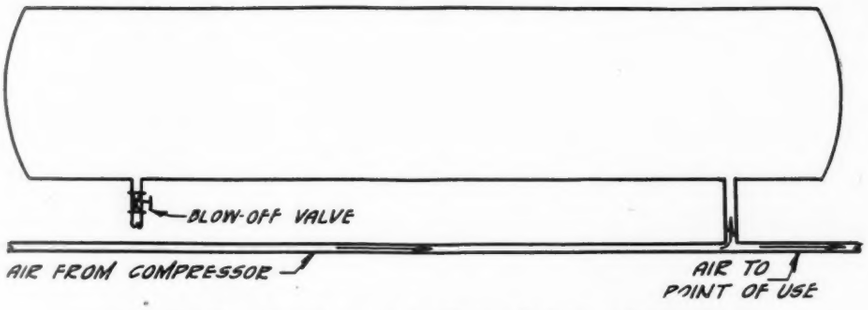


Fig. 2. This type of receiver will trap lighter explosive gases

Another possibility is that a collection of carbon dust, coal dust or other explosive dusts present in the incoming air, or residual carbon from the decomposition of the lubricating oil, might accumulate in the receiver or pipe lines. When a receiver is mounted as shown in Fig. 1 or 2, a common type of installation, it serves as a pocket to gather, accumulate and hold small amounts of explosive gases until such accumulation of gases becomes a menace.

Eliminating Dust and Gas Hazards

These conditions may all be eliminated by the proper installation of the receiver, as is recommended and shown in Fig. 3. A vertical tank is recommended with the inlet near the bottom, and so directed inside the tank as to diffuse the air uniformly throughout the tank.

The bottom of the tank should slope at an angle of 45 to 60 deg. This will eliminate pockets at the bottom for all air or heavy gas accumulations.

The exhaust should be from two or more points as shown, to eliminate all air pockets in the top of the tank and provide a completely air swept receiver.

These provisions will eliminate the dangers resulting from the mechanical construction and installation that permit accumulation of combustible or explosive gases.

Another point should be taken care of in protection from dust or gas explosions. It is known that the valves of compressors and other points in air lines sometimes become unduly hot. Such a condition provides a ready source of ignition to any inflammable material near it. It may also cause decomposition of oil, which has been pointed out as a contributing cause of hazardous gas and dust conditions.

To eliminate this danger a valve which sounds an alarm or which discharges the air automatically from the compressor and receiver when the temperature of the air or valves reaches a dangerous point, should be installed in the line between these units, preferably as near the compressor as possible. The operation of this valve might advantageously stop the compressor, as well as opening compressor and receiver safety valves. Such a valve would consist of a ball held in place by an alloy with low melting point. This alloy should cause the valve to operate when the temperature at the compressor valve reaches the flash point of the lubricating oil used, between 100 and 300 deg. C. Such valves might also be used at other points in the installation that seem to cause similar hazards.

Personal Equation Must Be Considered

A second cause of air receiver explosions is given as failure of the safety valve to function. This failure may be attributed to a number of causes, all of which may be eliminated by proper attention and certain comparatively simple details of construction. First of these causes is the failure to regularly check the valve so that it is known to be in working condition at all times. It is also essential that accumulations of oil and other foreign matter in the receiver be

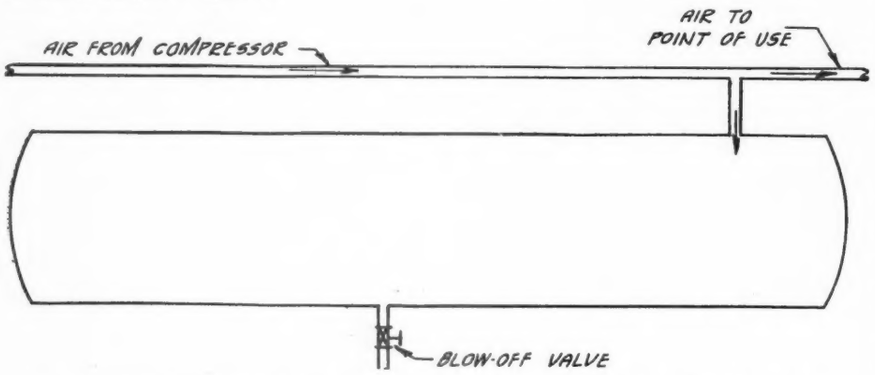


Fig. 1. A receiver of this kind, where air enters at top of receiver and leaves at top, will trap heavy explosive gases

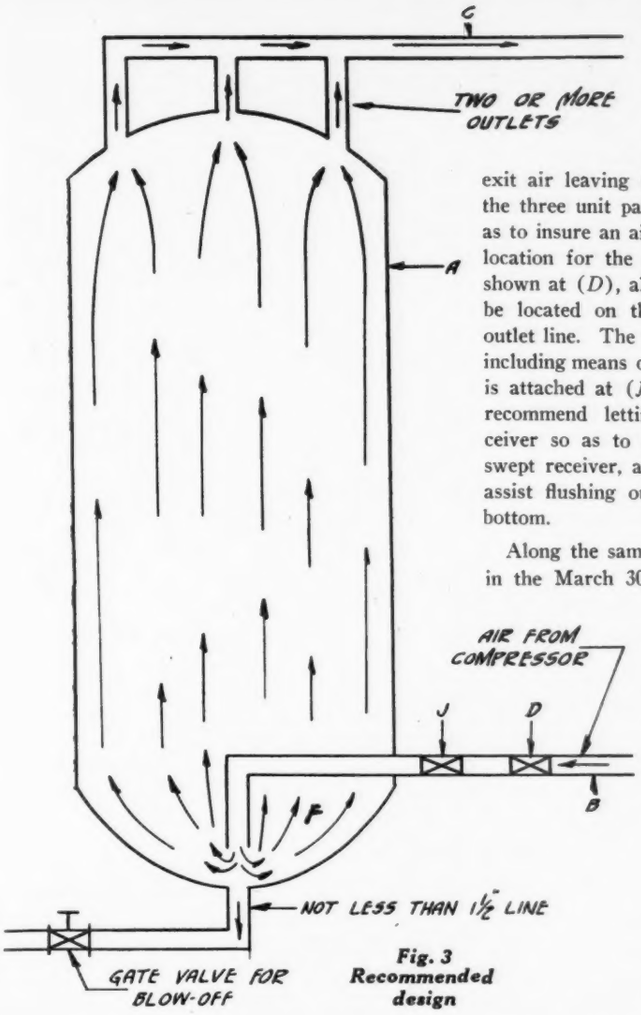


Fig. 3 Recommended design

regularly eliminated. Easy and convenient means to do this must be provided as operators are prone to neglect tedious or difficult tasks. Owing to the design of receivers this has been a haphazard operation in most cases, as the operator does not take time to make a thorough drainage, or the accumulated solids act as a dam or absorbent.

An Ideal Installation

Thorough purging of horizontal receivers is a difficult task. The belled end of vertical tanks makes purging somewhat easier but still is far from ideal. In the design which is recommended and shown in Fig. 3 the intent is to assist the operator in this purging operation and to take advantage of those available physical and mechanical devices to provide thorough purging. This is accomplished by the steep sloping bottom which provides natural drainage for the receiver. This terminates in a pipe with a gate valve for purging. The intake line should be designed to discharge toward this outlet. In addition to diffusing the air uniformly throughout the tank, this throws heavier particles in the incoming air at the discharge and acts as a jet to assist in flushing the tank.

A brief description of an installation as illustrated and recommended is: the receiver (*A*) is supplied air from the compressor (not shown) by the intake pipe (*B*) at a point near the bottom and with the exit air leaving through the pipe (*C*), the three unit parts being correlated so as to insure an air-swept receiver. One location for the heat operated valve is shown at (*D*), although the valve could be located on the receiver or on the outlet line. The whistle or other alarm, including means of stopping compressor, is attached at (*J*). (*F*) shows how I recommend letting air enter the receiver so as to insure a complete air-swept receiver, and also act as a jet to assist flushing out the inverted conical bottom.

Along the same lines, Letson Bailliet, in the March 30, 1929, issue of *Engineering and Mining Journal*, pointed out that the logical time to look for an air receiver explosion, if one were going to take place, would be just after the compressor is started up *after a short shutdown;* for while idle a little excess oil may drain into the cylinders from lubricating pipes. This oil, he points out, is heated, vaporized, partly volatilized, and punched into the receiver, perhaps above the temperature of ignition. This is followed by an explosion.

In starting the compressor at such a time, a cord pull upon a safety valve may liberate some of the hydrocarbon gases if any have collected, suggests Mr. Balliet. Then if the compressor were allowed to exhaust a half minute to the atmosphere after a short shutdown, on the theory of getting rid of any possible oil-gas accumulation, before turning it into the receivers that operation would be a further aid to safety.

Interesting Talks Published

DEMAND HAS BEEN so great, says the National Crushed Stone Association, Washington, D. C., for copies of two addresses given at the last annual convention that each has been prepared in pamphlet form and is available, at a small cost, to those who wish copies. These addresses, "Mental Self Discipline in Industry," by Dr. H. S. Hulbert, and "How to Win an Argument," by Professors A. C. Busse and E. E. Nyberg, New York University, were reported in the January 31 issue of Rock Products.

Concentrated Fertilizers

FOLLOWING IS A SUMMARY of a radio talk by C. H. Kunsman, acting chief, fertilizer and fixed nitrogen unit, United States Bureau of Chemistry and Soils, as reported in the *American Fertilizer:*

The three main substances of the more important fertilizers are nitrogen, phosphoric acid and potash.

For fertilizer purposes ammonia is used in this country largely in two ways: (1) It is mixed with air at a high temperature and passed over a catalyst, forming nitrogen oxides. (2) The ammonia is used directly in mixtures containing superphosphate.

The second plant food is obtained from phosphoric acid. Natural phosphate rocks are digested with sulphuric acid, giving phosphoric acid.

The third plant food is potash. The potash produced in this country amounts to about one-fifth of our consumption. The remainder is obtained from Europe.

The blast furnace offers promise of cheaper phosphoric acid and potash. The phosphate or potash-bearing rocks, or both, are mixed with coal or coke and brought to a high temperature in the blast furnace. The phosphorus and potassium leave the rock, vaporize, and go to the top of the furnace, where they are drawn off and collected, while the slag or residue is drawn off from the bottom of the furnace in a molten form.

Elements other than the big three, nitrogen, phosphorus and potassium, for example, calcium in the form of lime, and magnesium, are also very important as fertilizers and give a good increase in yields.

Gypsum, Lime and Alabastine, Ltd., Adds Another Product

AN ARRANGEMENT has been entered into whereby Gypsum, Lime and Alabastine, Ltd. (Canada), Paris, Ont., will handle the distribution of Donnacona Paper Co.'s new insulating wallboard. This is a move of importance to both companies, Donnacona receiving a retail distribution through some 7000 dealers, while Gypsum, Lime adds what should prove a profitable new line to its list of products.

Production of wallboard is a new venture for Donnacona, a subsidiary of Price Bros. and Co. In the early part of 1929 it was decided to construct a mill for the manufacture of a high grade insulating board, having a daily capacity of 150,000 sq. ft.

The mill was completed early in 1930 and brought into production during the first half of the year. To date domestic sales have exceeded expectations, while foreign sales have been slow but promising. With the new arrangement entered into with Gypsum, Lime anticipations are that sales in 1931 will play an important part in improving the earning power of Donnacona.

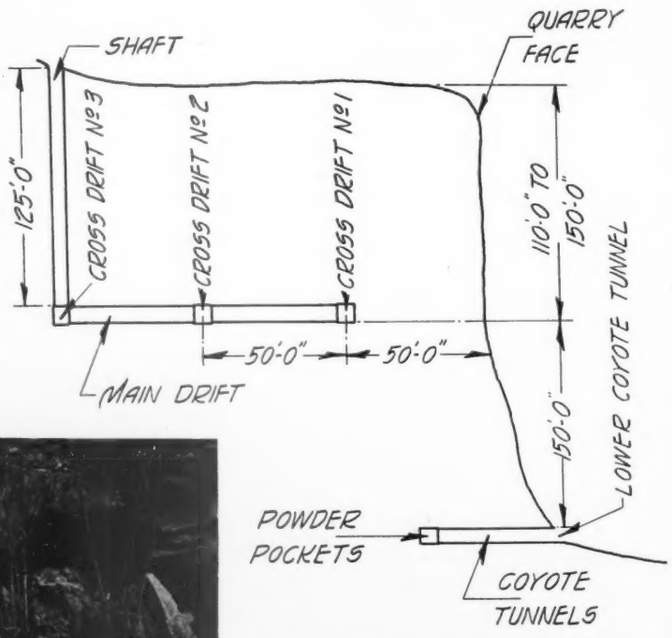
Unusual Shot at Dyer Quarry

AN UNUSUAL QUARRY SHOT which, it is believed, is the first of its kind ever attempted in this country, took place on March 24 last at the quarry of the John T. Dyer Quarry Co., Monocacy, Penn., under the supervision of du Pont technical men. The plan which was followed was conceived by William A. Kelly, recently deceased, who was for many years general superintendent of the quarry. Mr. Kelly found that it was expensive to well-drill his quarry and, under certain conditions, almost impossible, since the face ran from 150 to 265 ft. in height. After his first tunnel shot, at that time the largest ever fired in a trap-rock quarry in the foot of the quarry wall, he conceived the idea of having tunnels to replace well drills for the upper half. This procedure was not new, but the height of the face prohibited driving a tunnel straight in, half-way between the top and the bottom of this face, so he planned to sink a shaft in the rear to the proper depth and then tunnel toward the face. It was his purpose, if the plan worked out successfully, to have the same shaft serve for three tunnel shots.

In following out this procedure a shaft 6 ft. in diameter was sunk, 132 ft. from the face, and having a depth of 80 ft. A tunnel was then driven some 82 ft. forward, leaving a 50-ft. burden. From this, two lateral tunnels, parallel to the face, were constructed, the eastern lateral being 112 ft. and the western lateral being 107 ft.

It was planned to utilize this shaft for three tunnel shots. The first of these took place, as indicated before, on March 24 last. A load of 25,000 lb. of du Pont "Gelex A" was placed in 12 units spaced at the usual intervals in the lateral tunnels, the quantity in each unit being based on the rock tonnage the unit was meant to displace. The tunnel loading was only the usual method for similar jobs, but where it was the usual method to place stemming or tamping between the units it was determined not to do that in this case. Instead a 5-ft. reinforced-concrete bulkhead was built at the intersection of the main tunnel and the lateral tunnels. There were pipe openings for the Cordeau-Bickford fuse and electric cables and for the introduction of water tamping. The water was pumped into a tank on the hill far in the rear and then flowed by gravity into the shaft and tunnels. About 60,000 gal. were utilized.

A question in the minds of the men planning the job was, would there be any leakage, and, if so, what effect would this leakage have on the blast? It was discovered that there was only slight leakage, which was remedied by turning in a slight additional quantity of water on the day of the blast. When the explosive charge was shot, with 30-ft. head of water, it was found that it functioned perfectly.



Shot as first designed (from our issue of February 28)

Collar at mouth of shaft

Another question was, would the explosive gas acting on the water injure the back tunnel and the shaft? One of the du Pont men stood within 150 ft. of the shaft and the column of water rose some 60 ft. above the mouth and then fell straight down without wetting the surface area for a distance of more than 25 ft. around. The shaft was absolutely uninjured and even the steel casing near the top was not dislodged from its position. From the face of the shot it would appear that the angle of breakage in the rear of the lateral wall will permit the shooting of the next tunnel as planned when this is determined on in the future. The shot produced some 150,000 tons of stone, as expected.

Shaft excavated by derrick

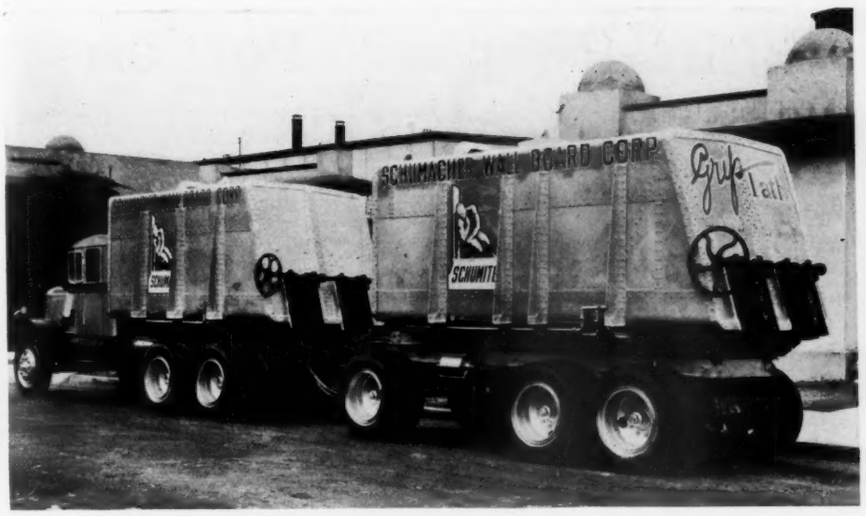
Tests of Dusting Material

ROCK DUSTS, after application in coal mines, may be wetted by mine water and, when dried, the dust may form a hard, coherent cake, thereby losing its effectiveness as a dust. Tests made at the Pittsburgh Experiment Station of the United States Bureau of Mines show that such caking characteristics vary for different rock dusts.

Dusts containing clay minerals usually form hard cakes when wetted asd allowed to dry. Some dolomites have been found to cake considerably. As a rule, powdered limestone forms a weak cake which crumbles readily.

A simple method of testing comparative caking properties of rock dusts consists of wetting the dust with water to a mud-like consistency and forming it into a circular pat on a piece of glass. A convenient size pat is one about 3 in. in diameter and ½ in. thick. These pats are allowed to air dry until thoroughly dry and then can be tested for caking properties.

A good grade of limestone will form a loose cake which readily crumbles between the fingers on slight pressure. On the other hand, materials with strongly caking characteristics form hard cakes which withstand considerable pressure before crumbling.



Aluminum truck bodies for transporting calcined gypsum

Increasing the Truck Pay Load

THE ACCOMPANYING ILLUSTRATION shows how one manufacturer in the rock products field has increased the truck pay load by the use of aluminum bodies.

The truck and trailer shown are used to transport calcined gypsum from the plant of the Standard Gypsum Co. at Long Beach, Calif., to the plant of the Schumacher Wall Board Corp., at Los Angeles, a distance of about 22 miles.

A Fageol, 10-ton, 6-wheel truck with 4-wheel synchro drive is used, along with a 10-ton, 6-wheel utility trailer, each unit being equipped with a dump body of "Duralyte," an aluminum alloy.

The truck has a tank body, 12 ft. long, weighing 1540 lb. and the trailer a tank body 14 ft. long weighing 1830 lb. Both bodies were furnished by the Yankee Motor Bodies Corp., Los Angeles, and are claimed to have the same strength as steel with only about one-third the weight. These units have now been in satisfactory operation for more than a year and a half.

When this method of hauling was first instituted the truck and trailer were equipped with steel bodies but these were soon discarded in favor of the lighter weight bodies in order to increase the effective carrying capacity, since the total permissible load is limited by law.

The weight of the steel bodies was 9800 lb. while the weight of the aluminum bodies is approximately 3400 lb. Thus the dead weight was decreased 3.2 tons and the live pay load increased by the same amount.

In other words the pay load of the truck and trailer was previously 17.5 tons and is now 20.7 tons, an increase of more than 18%.

Six trips are made daily so that the saving is almost equivalent to an extra trip a day, with some saving in gasoline consumption on the return trips because of the reduced dead weights.

The truck bodies are filled at the top and are emptied through the end gates. The material naturally packs in transit so that a small amount of compressed air is used at destination to aerate the load and facilitate dumping, this being admitted through the small pipes shown on the side.

Frederick M. Feiker Appointed Director, Bureau of Foreign and Domestic Commerce

FREDERICK M. FEIKER, managing director, the Associated Business Papers, Inc., since 1927, has been designated by President Hoover as director of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

Mr. Feiker is an electrical engineer, graduating from Worcester Polytechnic Institute in 1904. He has served as editor of a number of publications and as editorial director and vice-president of McGraw-Hill Co.

Urge Defeat of California Cement Plant Backers

DENUNCIATION of eight incumbent Los Angeles, Calif., councilmen for spot-zoning and for voting for the Bell cement plant ordinance is contained in a circular being broadcast in the districts which the eight officials represent.

The circular reads in part:

"On May 2, 1931, the State supreme court defeated the efforts of councilmen to force a cement plant industry into a distinctly residential district of our city.

"The failure of the Council to repeal these spot-zoning ordinances is going to waste $100,000 of your money in a useless special referendary election.

"Vote for the opponents of the above men."—*Los Angeles* (Calif.) *Examiner.*

Survey of Machinery Speeds

A SURVEY to determine present practice in various plants and industries with respect to the speeds of driving and driven machinery is being made by means of a questionnaire by a committee on speeds of machinery working under the procedure of the American Standards Association.

The purpose of the committee is outlined in the following program, tentatively adopted at the organization meeting of the committee. The information gained from the questionnaires will form the basis for the development of the proposed program. It comprises the establishment of: (1) A series of standard speeds of transmission shafting and driven machines, (2) a series of standard diameters of pulleys and of the pitch circles of gears and chain sprockets, (3) a series of standard widths of pulleys and of belts of different kinds, and a standard pull per inch of width for belts of each kind, (4) a standard series of belt speeds, (5) tables of: (a) the power to be transmitted by the maximum permissible torque in shafts of the different standard diameters at different shaft speeds, (b) the power to be transmitted per inch of belt width, by belts of a definite kind of material and construction, for different standard shaft speeds and different standard pulley diameters, (6) a standard series of diameters and width of sheaves for transmission ropes and of pulleys for steel transmission bands.

In developing this work the committee established a set of definitions of machine speeds which have been tentatively approved.

The questionnaire is accompanied by a table listing a proposed series of standard speeds which is submitted for criticism and comment as to whether the speeds in question would cover the needs in a satisfactory manner.

Recommend Beetle Control with Gypsum Dust

THE LARGE ANNUAL LOSSES of melons and cucumbers caused by striped cucumber beetles can be greatly reduced by thorough and timely applications of calcium arsenate and gypsum dust, according to H. K. Riley of the Department of Entomology, Purdue University Agricultural Experiment Station, who is conducting investigations on this insect pest.

Dusting with a mixture of 1 lb. of calcium arsenate and 20 lb. of gypsum is the most effective control measure known at present. The material acts more as a repellant than as a poison, and care must be taken to keep the plants thoroughly covered from the time they first appear above ground until the beetles have disappeared. The dust should be applied with a hand duster. A light uniform coating of the dust is sufficient to protect the plants.—*Loogootee* (Ind.) *Tribune.*

Silage as the Entire Roughage Portion of Cattle Fattening Rations

And the Part That Ground Limestone Plays in Such Rations

By C. W. McCampbell

Professor of Animal Husbandry, Kansas State Agricultural College, Manhattan, Kan.

THIS DISCUSSION is based upon investigations conducted by the Animal Husbandry section of the Kansas Agricultural Experiment Station and was presented at the Nineteenth Annual Livestock Feeders' Day held at the Kansas State College, Saturday, May 23, 1931.

Ten years ago the Kansas Station compared a ration consisting of silage, corn and cottonseed meal with the standard corn belt ration consisting of alfalfa hay, silage, corn, and cottonseed meal. The silage, corn, and cottonseed meal ration was inferior in every way to the alfalfa hay, silage, corn, and cottonseed meal ration.

These results prompted further study of the value of alfalfa hay in cattle fattening rations, so another test was conducted in which four lots of good quality range-bred calves were fed 195 days.

Each lot was fed silage, corn, and cottonseed meal. In addition alfalfa hay was fed different lengths of time in the four lots.

Lot 1 received *no* alfalfa hay at any time during the tests and made a profit of $0.07 per head.

Lot 2 received alfalfa hay at the rate of 2 lb. per head per day during the last 75 days of the feeding period and made a profit of $5.19 per head.

Lot 3 received alfalfa hay at the rate of 2 lb. per head per day during the last 135 days and made a profit of $7.38 per head.

Lot 4 received alfalfa hay at the rate of 2 lb. per head per day during the entire feeding period of 195 days and made a profit of $11.10 per head.

Why Alfalfa Hay Is So Valuable

This experiment shows the very great value of feeding even a small amount of alfalfa hay to cattle that are being fattened for market. The results secured caused us to wonder why it was so valuable. Its chemical analysis shows that adding alfalfa to a ration adds protein. This additional protein can easily be made up by increasing the cottonseed meal or other protein supplemental feed used. Adding alfalfa hay also adds a large amount of lime. This may be emphasized by directing attention to the fact that 1 lb. of alfalfa hay contains as much lime as 100 lb. of shelled corn. The large amount of lime in alfalfa hay made us think that possibly the lime in alfalfa hay was a major factor in determining its value in cattle fattening rations, particularly when we noted that all the other feeds in the ration—silage, corn, and cottonseed meal—are low in their lime content.

This speculation on our part resulted in a test having for its main purpose a study of several different forms of lime suitable for livestock feeding purposes. Taking everything into consideration, powdered limestone containing a high percentage of calcium carbonate (98 to 99%), proved to be the most satisfactory.

Author's Note

IN THE March 23 issue of ROCK PRODUCTS you printed the article I submitted dealing in a general way with the matter of feeding ground limestone to cattle.

On May 23 I discussed at the Nineteenth Annual Livestock Feeders' Day the possibility of using silage as the entire roughage portion of cattle fattening rations. At first thought this may not seem to be of any particular interest to your readers, but it may be of more interest than it seems because of the fact that silage can be used as the entire roughage portion of cattle fattening rations only when fortified with lime, and ground limestone has proved to be a most satisfactory form in which to use lime for this purpose.

We have been working on this problem for ten years and I am enclosing herewith a brief story of this ten years' study which finally developed the facts set forth above. This information is quite significant because it makes possible a material expansion of the cattle feeding areas of the country. It means that thousands of persons who have been raising cattle in the midwest and southwest, where little or no hay is produced, and shipping them east for someone else to fatten for market, can now fatten for market the cattle they raise, because silage can be produced in almost every section of the country.

The large number of letters I have received about my story in the March 28 issue prompted me to send you the enclosed story.

—C. W. McCampbell.

Pulverized Limestone Substitute for Alfalfa Hay

The tests up to this point indicated the possibility of replacing the lime in alfalfa hay with the lime in powdered limestone. The next step was a series of tests to prove or disprove the practicability of such procedure. Such a series of tests was started in the winter of 1925-26 and repeated during the winters of 1926-27 and 1927-28. These tests compared the standard corn belt ration consisting of grain, cottonseed meal, silage, and alfalfa hay with a ration consisting of grain, cottonseed meal, silage, prairie hay, and ground limestone. Prairie hay, which is comparatively low in lime compared to alfalfa hay, was used because of the prevailing tradition that a dry roughage must be fed with silage. The standard corn belt ration gave slightly better results the first two years but the other ration gave better results the third year. The average for the three years favored slightly the grain, cottonseed meal, silage, prairie hay, and powdered limestone ration.

The favorable results secured from the use of silage and prairie hay plus powdered limestone encouraged us to forsake the tradition that a dry roughage must be fed with silage and to try out silage fortified with powdered limestone as the roughage portion of a cattle fattening ration. In this connection it might be well to direct attention to the fact that a large section of the country that does not now fatten its cattle for market could do so if silage could be depended upon as the entire roughage portion of cattle fattening rations because this area produces either corn or the sorghums and where either are produced silage can always be had. Furthermore, if silage alone could be used satisfactorily as the roughage portion of cattle fattening rations, cattle feeding costs could be reduced materially on many farms of the corn belt.

The tests discussed and the facts just stated led to the next series of tests which are reported in detail in this article.

This series of tests was started in the winter of 1928-29 and repeated during the winters of 1929-30 and 1930-31. In this study major emphasis was placed upon the possibility of using silage alone as the roughage in cattle fattening rations. Each year a lot fed silage, corn, cottonseed meal and ground

limestone was compared with a lot fed alfalfa hay, silage, corn, and cottonseed meal, the latter ration being commonly known as the standard corn belt cattle fattening ration. In order that we might have cattle as near alike as possible in every way, including inheritance, calves raised by the Matador Land and Cattle Co., of Matador, Tex., were used each year. The feeding period averaged 178 days for each year.

The first year's results were practically the same in each lot. The second year's results favored the silage, corn, cottonseed meal, and ground limestone ration. The third year's results (1930-31), again favored the silage, corn, cottonseed meal, and ground limestone ration.

Results of Experiments

The average of the three tests may be summarized as follows:

LOT 1—The calves in this lot were fed the standard corn belt ration consisting of alfalfa hay, silage, corn, and cottonseed meal. The average initial weight for the three tests was 371.07 lb. per head; the average final weight 771.60 lb.; and the average daily gain 2.25 lb. The daily feed consumption was 2.0 lb. of alfalfa hay; 9.89 lb. of silage; 8.81 lb. of corn; and 1.00 lb. of cottonseed meal per head. The cost of gains averaged $7.89 per cwt.; the appraised value $10.25 per cwt.; and the margin over cattle, feed, and labor costs $2.78 per head.

LOT 2—The calves in this lot were fed silage fortified with powdered limestone, corn, and cottonseed meal. The average initial weight for the three tests was 374.41 lb. per head; the average final weight 790.49 lb.; and the average daily gain 2.34 lb. The daily feed consumption was 12.90 lb. of silage; 8.70 lb. of corn; 1.26 lb. of cottonseed meal; and 1/10 lb. of powdered limestone per head. The cost of gains averaged $7.55 per cwt.; the appraised value $10.50 per cwt.; and the margin over cattle, feed, and labor costs $6.48 per head.

A comparison of the data just presented which represents the average of three tests, shows that the daily gains were slightly greater, the cost of gains slightly less, the selling price slightly greater, and the margin per head above cattle, feed, and labor costs greater in Lot 2 where silage, fortified with a small amount of powdered limestone, was used as the entire roughage portion of the ration fed.

Observations

These results indicate:

1. That silage alone supplemented with a small amount of high calcium content powdered limestone (1/10 of a pound per head per day) is a satisfactory roughage in cattle fattening rations.

2. That a ration consisting of silage supplemented with a small amount of high calcium content powdered limestone (1/10 of a pound per head per day) plus grain plus protein supplement, is as satisfactory as a cattle fattening ration as the standard corn belt ration consisting of alfalfa hay plus silage plus grain plus a protein supplement.

3. That wherever grain sorghums or corn can be produced, cattle can be fattened for market satisfactorily even though hay, either legume or non-legume, is not available; because sorghum silage or corn silage supplemented with high calcium content powdered limestone provides a satisfactory roughage in cattle fattening rations. In other words, the grain sorghums and corn can be fed on the farm where produced.

4. It should be emphasized that limestone used to fortify silage must be in a powdered form and contain at least 95% calcium carbonate.

New Rockwood Plant for Southern California

THE ROCKWOOD CO. of Los Angeles, Ltd., has plans practically completed and expects to start construction soon on a plant for the manufacture of "Rockwood" gypsum lumber in the Los Angeles district.

This company was incorporated recently and has been granted the exclusive manufacturing and selling rights for southern California, Arizona and Nevada by the Rockwood Corporation of America, which owns the patent rights covering this product.

The new plant, which it is expected will be completed in four months, will cost approximately $100,000, and will have an initial capacity of about 200 tons per day. It will be of steel construction with two casting units and with automatic machinery and push-button control throughout.

The same general scheme of manufacture will be used as at the plant of the Rockwood Co. of St. Louis, which operation was described in ROCK PRODUCTS, March 30, 1929.

Although prepared to manufacture all the various sizes and shapes of Rockwood, the business will at first as far as practicable be confined to the manufacture of partition units used for walls and roofs.

The manufacturing process consists in mixing calcined gypsum with water and casting it in molds to form hollow shapes which when they have set may be sawed and nailed and in general handled the same as timber or lumber. The units are grooved on the edges so that they are interlocking and are made in long enough lengths that only one length set vertically is used for partition walls. The same units are also used for roofs, while other units of different cross-sections are used in place of tile as forms for reinforced-concrete floors.

As against lumber they possess the advantages of being fireproof and are also lighter in weight than tile and other partition materials. Less dead weight and lower costs of installation are claimed than for other types of fireproofing, as well as better insulating qualities. This type of building unit was developed in St. Louis about four years ago and has been used in a large number of structures in that section.

The calcined gypsum which will be used in the manufacture of these building units will be furnished by the Standard Gypsum Co. from its Long Beach plant and will be transported by truck to the Rockwood plant, which will be located between Long Beach and Los Angeles.

The offices of the Rockwood Co. are at 807 Architects Building, Los Angeles, Calif. Fred C. Kingsbury is president; Ray Thomas, vice-president; Charles Dull, secretary-treasurer, and J. A. Thomas, engineer.

Report Normal Production at Gypsum Plant

WHILE THE building trade is not booming at this time and while general conditions are not such as to witness any large expansion programs, the United States Gypsum Co. mine and plant at Centerville, Ia., are doing a normal production business as compared with the past records of the mine, and every preparation is being made for an expansion of business which is hoped to come.

At the plant recently local officials of the company said that they did not wish to issue any statements at the present time concerning future business, other than to say that the mine is being gotten into such shape as would find it capable of handling a greater demand for the local gypsum product.

Samples are being widely circulated of the local gypsum products and it is hoped that these will result in some good contracts. While the gypsum company officials are very cautious about raising any hopes that might not be fulfilled, it would seem that a considerably increased production at the local plant can reasonably be expected within the next few months.—*Centerville* (Ia.) *Iowegian.*

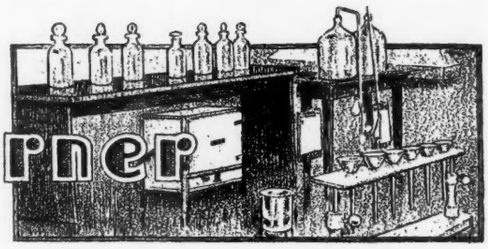
New Gravel Plant in Oklahoma

THE INSTALLATION of gravel pit equipment by the Macon Construction Co., Oklahoma City, Okla., 3½ miles northeast of Sulphur, is now being made.

Modern equipment is being installed; all machinery being driven by electricity. W. R. Davis, engineer in charge of construction, said the plant now being placed would be able to put out up to 20 carloads of gravel per day, but that they would probably put out only 10 cars for the present. Practically all of this will go to Oklahoma City, as the Macon company has contracts requiring this amount of material. He also stated the plant would be in operation about June 6.

The plant is located adjacent the Frisco railroad.—*Sulphur* (Okla.) *Democrat.*

The Chemists' Corner



Characteristics of Blast Furnace Slag Slurry in Portland Cement Manufacture

By L. N. Bryant

Supervising Chemist, Basic Products Co., Davison Coke and Iron Co.
("Green Bag" Cement)

THERE ARE at present in the United States three cement mills using a blast-furnace slag mix wet process, with a total annual capacity of about three million barrels; namely, that of the Ford Motor Co. at River Rouge, Detroit, Mich., the Bessemer Limestone and Cement Co., Buffalo, N. Y., and the Davison Coke and Iron Co., Neville Island, Pittsburgh, Penn. At one of these mills air-cooled slag is used, and at the other two, granulated slag.

Air-cooled slag is produced by simply allowing the slag to run while molten into a pit or to any convenient location, or poured into ladles. It is then permitted to cool slowly, and, in the case of the ladles, dumped when cooled. This produces a very hard, stony-like mass which contracts and cracks somewhat as the cooling proceeds.

Granulated slag is produced by running the molten slag directly into a pit and immediately quenching or granulating with water. This produces a very porous material resembling very much in appearance sea sponges, varying in size from minute particles upward to a size of several inches. The porosity and size of this material depends upon several factors, such as the temperature of the slag, volume of the water, etc. Large sizes break down very easily in handling.

Granulated slag has the advantages over air-cooled slag in that it is removed from the pit and conveyed with less difficulty, requires no crushing before being fed to the mills, and, being of a smaller particle size, permits a more efficient separation of tramp iron.

Advantages of Blast-Furnace Slag

The advantages of using blast-furnace slag are obvious. Those of primary importance are:

(1) That a material that is generally considered a waste product in the pig iron industry is converted into a valuable by-product.

(2) There are required a lesser number of pounds of raw material to be ground to produce a barrel of slurry, resulting in higher mill capacity.

(3) A lower fuel consumption per barrel of clinker may be attained due to the lime constituent in the slag being calcined in the blast furnace.

The following are typical analyses of slurries made from clay and limestone, and slag and limestone:

CLAY-LIMESTONE
588 lb. per bbl.

SiO_2	13.62%
Al_2O_3	4.36%
Fe_2O_3	1.59%
CaO	43.39%
MgO	0.85%
Ignition loss	36.01%

SLAG-LIMESTONE
500 lb. per bbl.

SiO_2	16.07%
Al_2O_3	4.85%
Fe_2O_3	2.32%
CaO	50.50%
MgO	1.14%
Ignition loss	24.88%

Note: Weight of raw materials per barrel for 376 lb. of clinker is theoretical and does not take into account dust losses, etc., encountered in the process.

Assuming all other thermal data to be equal, the fuel economy to be expected when using the slag mix would be in proportion to the decrease in weight of the CO_2 and other constituents to be evolved. Using the dry basis and assuming that the lime in the clay mix is in the form of calcium carbonate or 455.5 lb., and that 95% of the loss on ignition in the slag mix is CO_2 or 268.6 lb. of calcium carbonate, the heat necessary for decomposition is found, according to the formula by Geoffrey Martin:*

Lb. $CaCO_3 \times 0.267$ (specific heat 60 deg. F. to 1481 deg. F.) $\times$ 1421 =

Clay mix	172,819 B.t.u.
Slag mix	101,908 B.t.u.
Difference	71,111 B.t.u.

(About 6 lb. average coal)

Advantages and Disadvantages of Wet Process

The wet process is used in that no drying of the raw materials is necessary before grinding, higher efficiencies are obtained in the raw grinding mills, and a finished prod-

*ROCK PRODUCTS, December 20, 1930.

Editor's Note

THE EDITOR considers this a particularly valuable and significant contribution to our "Chemists Corner," not so much for the subject matter, although this is valuable and helpful, but because it illustrates the need for and the application of original research work at practically every cement plant. Raw materials vary somewhat. There are special problems in determining each set of conditions. There are special problems in arriving at optimum results under each set of conditions. To solve these problems intelligently requires real, original research into all phases of the problem.

Such plant research work almost invariably develops data of general interest to other research workers and chemists. And for the publication and circulation of such data this "Chemists Corner" exists. We do not expect plant research workers to reveal all the results of their experiments, but by divulging some of the fundamentals, as in this case, much is added to the general fund of technical knowledge, and all cement chemists are aided in their own work.

The author, in his letter of transmittal, writes: "The theories and conclusions given in this work are the results of testing and study covering a period of about two years. As in all such theories, before being proven and accepted as facts, results must be confirmed by others; and in this I am open to such criticisms as may be forthcoming."

May we again urge cement, lime and gypsum plant chemists to make more use of these columns? —The Editor.

uct more uniform and of higher quality may be manufactured.

With the advent of this process there has arisen a very serious objection to its use because of the tendency of the slurry to set or congeal. This tendency is more pronounced when using granulated slag than when using air-cooled. At times this action is more rapid than at others, even when using slag of the same type. Apparently, the time element, or rather the age of the slurry, is the predominating factor in the congealing action. After standing in the tanks, though vigorously agitated, there is a noticeable thickening, as if much moisture had been lost. As this thickening proceeds a greenish color is attained, followed by the formation of hard rings or a coating which rapidly accumulates upon the tank walls.

If allowed to remain, in some cases but a few hours longer, this coating will rapidly grow toward the center of the tank, forcing the mechanical agitators to stop and producing a dense solid. Sometimes air-hammers are necessary for the removal of such slurry, but always much delay and labor is required. The same action is found in slurry pipe lines and all other places where the material is conveyed or stored.

At the first mill to use the blast-furnace slag mix wet process, great difficulty was encountered in feeding the slurry into the kiln, due to the rapid congealing and subsequent ring formation at the feed end. Happily, this condition was soon eliminated after the installation of American disc type slurry filters, which reduced the moisture in the slurry to a point where the plasticity of the material was insufficient to form a heavy coating on the kiln lining. The other two mills which were constructed later included this type filter in their design.

Filters Prevent Slurry Troubles

The installation of filters has overcome ring trouble in the kilns; however, considerable difficulty is yet encountered in filtering slurry which has progressed fairly well into the congealing stage, as a result of the hardening of the material in the filter reservoir, and the abnormally thick cake which is picked up even though the lowest pickup vacuum be used. Under normal conditions a cake with a thickness of from 5/8 to 1¼ in. is obtained. Quite frequently when filtering congealing slurry the cake will acquire a thickness of 3 or 4 in. The moisture content of the cake under normal conditions will be from 16% to 22%. Under congealing conditions the cake will frequently contain as much as 30% moisture; and, while on the filter cloth it will apparently be well dryed and firm, upon falling to the conveyor belt will liberate, due to shock, sufficient water to form a soft, almost flowable slurry.

The general procedure followed to prevent difficulty due to congealing slurry is to maintain but a limited quantity on hand and burn the material as soon as possible. This system limits the flexibility of operation and does not always allow the plant chemist the proper materials and time necessary for a suitable mix.

Due to the detrimental effect of the nature of the slurry upon the ultimate success of this process, the writer has undertaken an exhaustive study of the characteristics of this material, the most important results and conclusions of which are given below.

Characteristics of Slag Slurries

In view of the fact that as congealing proceeds there is a gradual decrease in mobility, a relative viscosity test was used as a measure of this property. Large portions of the various slurry samples were placed in containers of suitable size and well covered to prevent loss of moisture. In the series under "Effect of Temperature" the various samples were heated or cooled as was necessary, to a temperature of 85 deg. F. before the determinations.

In each of the other series the temperature of 85 deg. F. was maintained throughout the test periods and the factors such as fineness, moisture, and composition were constant with the exception of the object variables. Viscosity determinations were made until a relative viscosity of 140 seconds was produced, which was about the limit of the viscosimeter. The slurries at this point were very heavy, so heavy in fact that pumping under actual operating conditions would have been extremely difficult. Granulated slag was used in all the slurries with the exception of the variable in Series No. 1.

The effects of various percentages of moisture and fineness were studied along with the other experiments, the effects of which were not so pronounced, however. As shown by these determinations, the lower the moisture (within reasonable limits) and the higher the degree of fineness, the more rapid was the congealing.

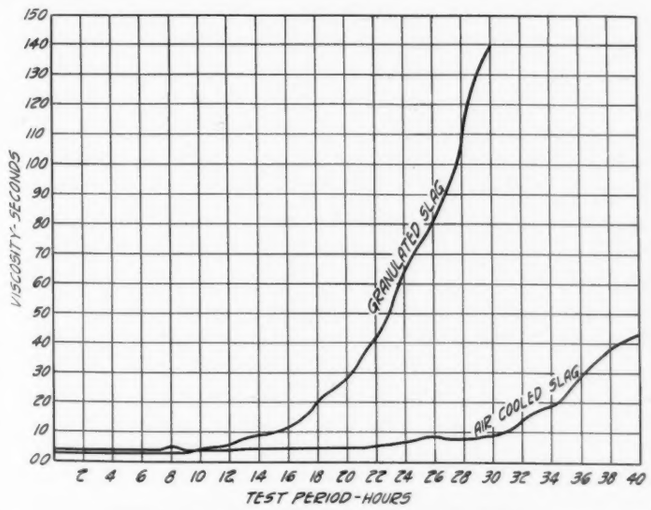
Results of Experiments

SERIES No. 1—"Air Cooled Slag vs. Granulated Slag" shows vividly the superiority of granulated slag in reactivity.

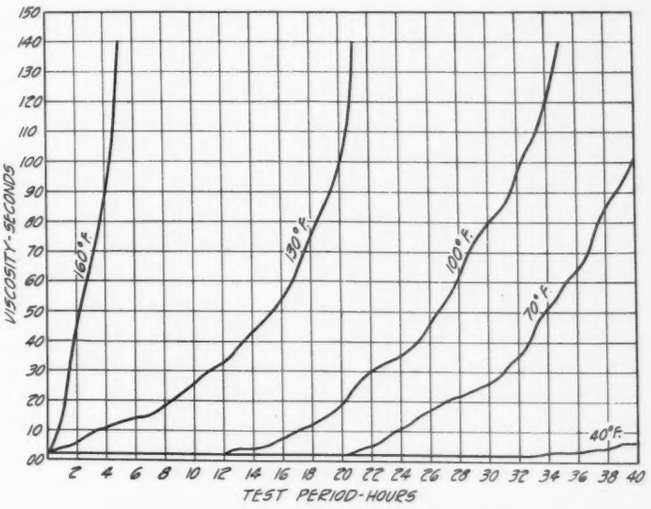
SERIES No. 2—"The Effect of Temperature" established facts rather startling, indicating that from an average operating standpoint the dangerous or critical temperature would be above 100 deg. F.

SERIES No. 3—"Effect of Increased Alkalinity" shows conclusively that an increase in this component increased the reactivity.

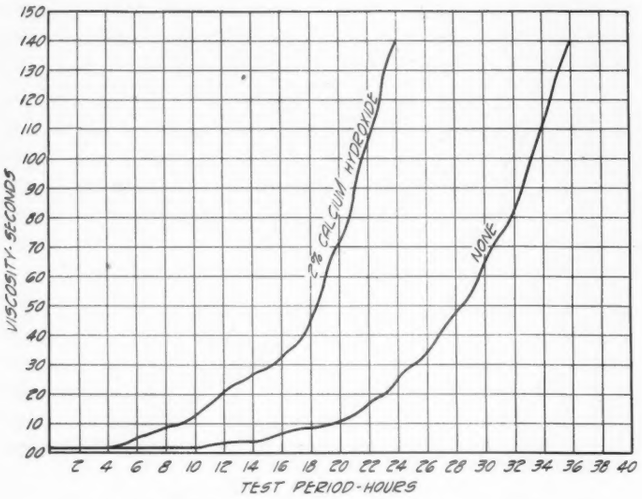
At this time the question as to whether blast-furnace slag hydrates and liberates calcium hydroxide was to be solved. According to Werner P. Eckdahl in his patent (U. S. Patent, No. 1,693,644) covering the use of CO_2 gas in blast furnace slag slurry —"Carbon Dioxide reacts with any basic oxides of the alkaline earths present in the slag, and coats the individual particles of slag with a coating of carbonate that protects against subsequent hydration." Should the decomposition of the basic silicates and aluminates to form calcium hydroxide be true, this constituent could be determined



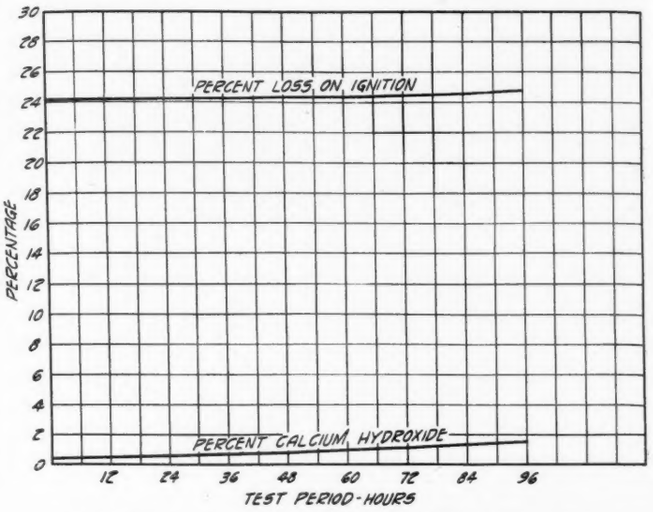
Series No. 1. Air-cooled vs. granulated slag



Series No. 2. Effect of temperature



Series No. 3. Effect of increased alkalinity



Series No. 4. Increase in alkalinity during congealing

in the various stages of congealing by the well-known volumetric method and by the increase in loss on ignition of the slurry after drying at 105 deg. C. These determinations were made on a sample of normal slurry until complete set, the results of which are given in the illustration under *SERIES No.* 4—"Increase in Alkalinity During Congealing."

Conclusions in Regard to Series Nos. 4 and 5

Conclusions drawn from these determinations were:

Blast furnace slag does not hydrate in its entirety, but becomes hydrous only. The small percentage of calcium hydroxide liberated could be derived from the only soluble substance, calcium sulphide, which breaks down accordingly—

$2CaS + 2H_2O = (OH)_2 + Ca(SH)_2$

The percentage of calcium hydroxide, though comparatively small, is no doubt sufficient to have an accelerating effect upon congealing. The component $Ca(SH)_2$ being a very unstable compound is further decomposed, increasing the alkalinity. Although this reaction is reversible, the ultimate decomposition depends upon the volatilization of the H_2S or its combination with other constituents.

Establishment of the facts in the above series naturally oriented to *SERIES No.* 5—"The Effect of Sulphur Content of Slag." As shown in this series, the slurries containing higher percentages of sulphur are more reactive.

Apparently, with other factors equal, the rapidity of congealing was due to the quantity of calcium hydroxide liberated by the calcium sulphide reaction. To overcome this factor the addition of a neutralizing agent was necessary. Carbon dioxide in the form of gas, producing carbonic acid, and sodium bicarbonate (dry), each carrying a positive charge, and calcium chloride (dry), and calcium hydroxide (dry), carrying negative charges, were added, the results of which are illustrated under *SERIES No.* 6—"Effect of Reagents of Opposite Sign." It was difficult to determine the exact quantity of carbon dioxide gas to pass through that particular sample of slurry, due to the lack of knowledge of the rate of absorption; however, an equal number of gram mols of each of the other reagents were added to their respective samples.

Conclusions drawn from this series were:

(1) Positively charged soluble reagents decrease or prevent congealing.

(2) Negatively charged soluble reagents increase the rate of congealing.

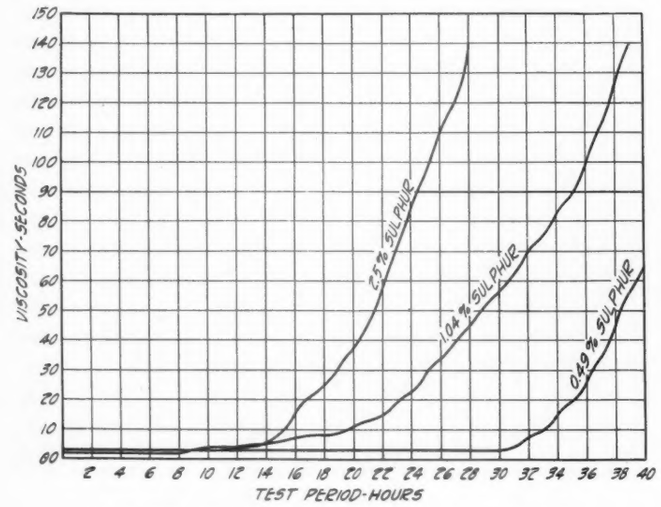
Note: The carbonic acid reacts with the hydroxide or sulphide. The sodium bicarbonate reacts accordingly:

$2\,NaHCO_3 + CaS = CaCO_3 + Na_2CO_3 + H_2S$. The odor of H_2S is immediately noticed after the addition of the bicarbonate.

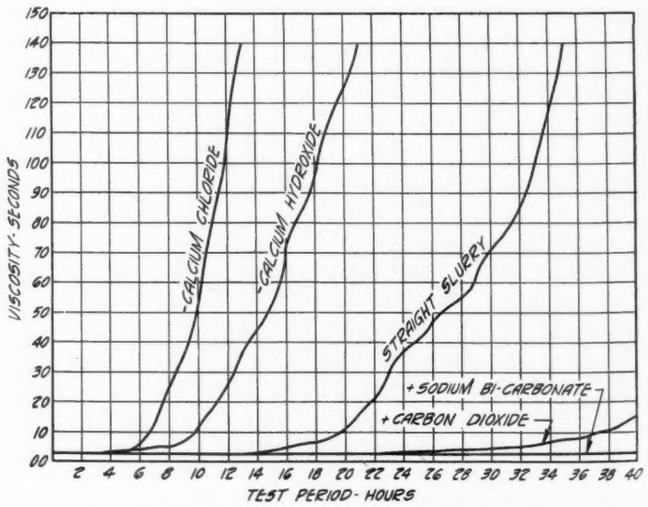
The slight increase in viscosity of the carbon dioxide sample was probably a result of further increase in alkalinity, there being insufficient carbonic acid present to neutralize it.

Series Nos. 7 and 8

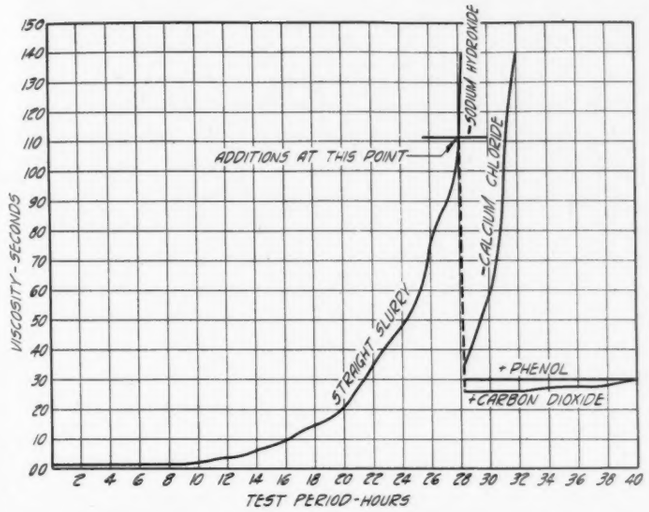
SERIES No. 7—"Effect of Reagents of Opposite Sign" was similar to the above series with the exception that the reagents



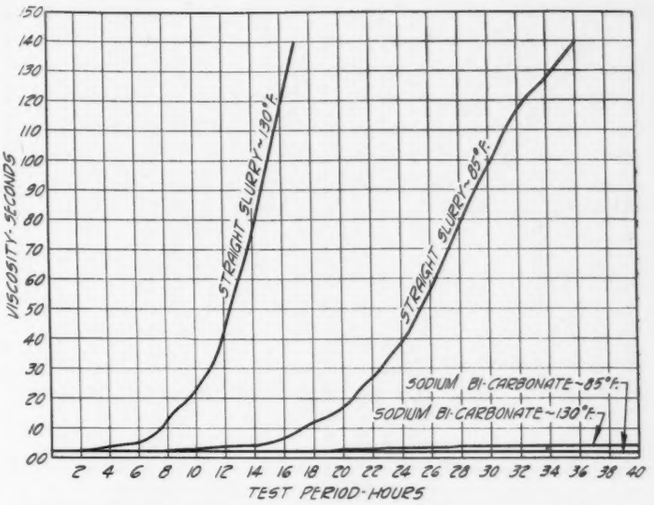
Series No. 5. Effect of sulphur content of slag



Series No. 6. Effect of reagents of opposite sign



Series No. 7. Effect of reagents of opposite sign



Series No. 8. Effect of temperature in the presence of an excess of a positively charged electrolyte

were added after congealing had progressed sufficiently to form a very heavy slurry. The results of these determinations confirmed conclusions in *SERIES No. 6*. The action produced by calcium chloride was very enlightening and a theory covering this phenomenon will be given in a later paragraph. (Note: The phenol reacts with calcium hydroxide to form the phenolate.)

SERIES No. 8—"Effect of Temperature in the Presence of an Excess of a Positively Charged Electrolyte" shows conclusively that the negative ion must be present to promote congealing even with higher temperatures.

Slurries with Higher Water Content

The results given in the preceding series were all concerned with slurries of relatively low water concentration. For further information regarding congealing action it was desirable to study this factor under more dilute conditions. The general procedure followed in this study was as follows:

A given weight of the dry slurry was placed in a graduated cylinder with a large excess of water and the respective reagent, and shaken at regular intervals. Subsequent readings were made of the volume of solids after settling. All factors were maintained constant with the exception of the object variables. The results of the experiments are given in the accompanying illustration under "Effect of Reagents of Opposite Sign Upon Swelling or Volume Change." Conclusions drawn from this series were:

(1) Negatively charged soluble reagents promote an increase in volume, and positively charged soluble reagents decrease volume.

(2) Without agitation, volume changes do not occur to any appreciable extent, but the material becomes extremely hard and dense. With agitation, the presence of an excess of negative electrolyte is necessary to produce an increase in volume.

(3) Carbon dioxide at the early period prevented an increase in volume but later this sample increased in volume, indicating further hydration of calcium sulphide. A later addition of this gas reduced the volume; however, agitation was necessary before the decrease in volume was noticeable.

(4) The sample containing added calcium hydroxide was accelerated in volume in the early stages. The sample containing no addition attained an equal volume to that of the hydroxide at the later period. This was no doubt due to the same solution concentrations of calcium hydroxide being reached.

(5) Slag slurry does not expand beyond the water limit. This is not the case with the average flue-dust slurry which exhibits considerable expansion above water level.

Experiments on Filterability

Another important series of tests which have a more practical value from an operating viewpoint consisted in permitting slurry to congeal under ordinary conditions, checking viscosity and using the leaf test to determine filterability and drying efficiency, the results of which are given graphically, and so plotted for convenience in comparison. The conclusions drawn from this series were:

(1) There is a proportional relationship between the viscosity of the slurry and the quantity or size of the filtered cake, or, as viscosity increases a greater quantity of filter cake will be obtained, all other factors being equal.

(2) There is a proportional decrease in drying efficiency as viscosity increases, and *vice versa*.

Colloidal Behavior of Slurry

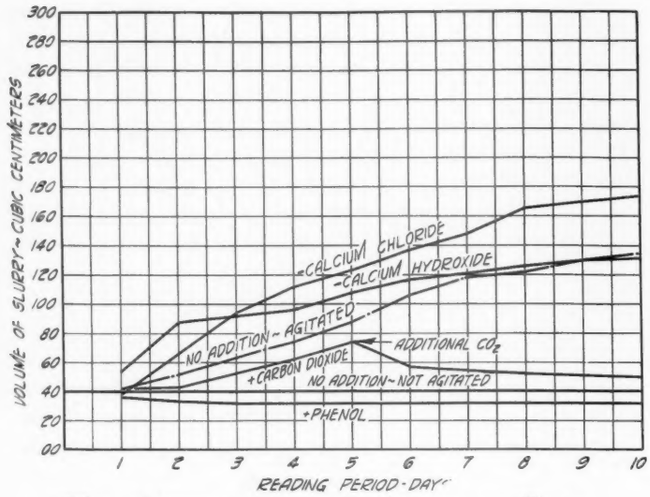
From the results obtained in the various tests of slurry, the indications are that the principal reactions occurring in the congealing action of this material are of a colloidal nature. In order that a more clear conception of the theory of this reaction be obtained, a few of the characteristics of colloidal behavior which apply to this particular material are given as follows:

(1) Colloid chemistry deals with the properties and behavior of matter in a very fine state of subdivision, known as the colloidal condition. The most striking results of the subdivision of a substance to colloidal dimensions are manifested in the enormous development of free surface energy. With increasing subdivision of matter into smaller and still smaller particles we begin to enter the zone wherein molecular and physical forces begin to play an increasingly important part, until they finally become dominant. From this it is obvious that surface forces such as surface tension, adsorption and chemical attraction become very greatly magnified and therefore of extreme importance.

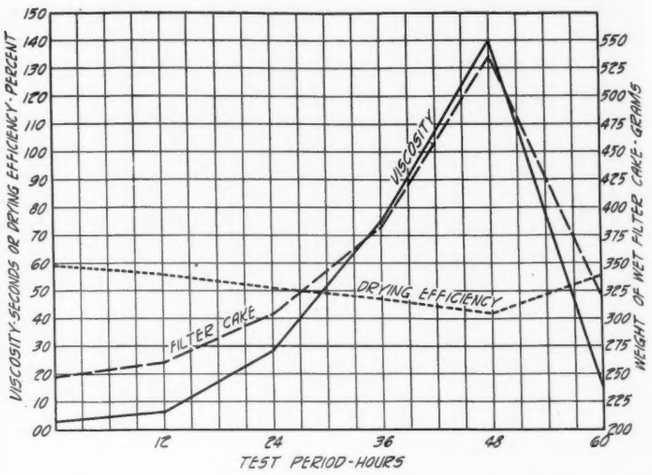
(2) Surface tension determines the degree of distribution over interfaces and is a measure of the power of inward like molecules to attract outward like molecules of a particle and resist the attraction of surrounding unlike molecules. The reverse of this is what Ostwald terms expansive surface energy, the power of which is known as internal pressure and depends upon the balance between the various forces exerted upon the molecules within the particle, being increased by temperature and electrification.

(3) If interfacial tension decreases with increasing concentration the surface will contain an excess of solute over the solution. This is termed positive adsorption. If interfacial tension increases with increasing concentration, the surface will contain an excess of the solution over the solute. This is generally termed negative adsorption. Generally speaking, in positive adsorption the solution becomes more dilute and in negative adsorption the solution becomes more concentrated.

(4) Most solids are negatively charged



Effect of reagents of opposite sign upon swelling or volume change



Effect of congealing on filterability and drying efficiency

against water; oxides and carbonates are exceptions inasmuch as they carry a positive charge under similar conditions. The preceding statements are true only in a limited sense, as it is possible to change the sign of the charge in most cases by the addition to the water of extremely small quantities of electrolytes of opposite sign.

(5) Colloids are swollen only by substances which penetrate them. The degree of swelling depends upon the force of attraction of the solvent to the interfaces between the particles and is greatly accelerated by electrolytes. The positive or negative ions are adsorbed and their electric charge forces the particles further apart.

Problems to Be Solved

A summary of the results obtained in the preceding tests brings forth several problems to be solved, the answers for which at this time can be theoretical only.

(1) Why is granulated slag more reactive than air cooled slag?

(2) Why does increased alkalinity or calcium sulphide increase reactivity?

(3) Why do negatively charged electrolytes promote and positively charged prevent congealing?

(4) Why does calcium chloride, a negatively charged electrolyte, after congealing has progressed, decrease viscosity; then in turn increase this factor?

(5) Why is agitation necessary to increase volume when a negative charge is present and also to decrease volume when a positive charge is present?

Some Explanations

The answers to these questions are:

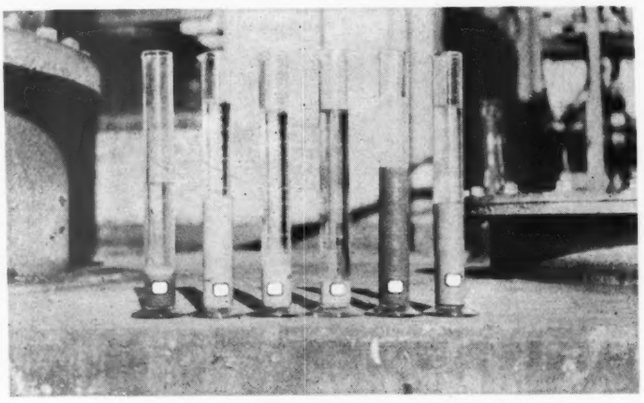
(1) Recalling the facts that granulated slag is produced by a sudden cooling and expansion process, and that air-cooled slag is produced by a slow cooling process, followed by contraction, it is natural to assume that the crystals are smaller and the molecular spacing in particular is of a much greater magnitude in the granulated slag. This would tend to facilitate a much more rapid penetration of the water to the particle or molecular interfaces. A striking example of the effect of molecular spacing is in the comparatively slow rate of hydration of overburned lime which has a much smaller spacing than the lighter burned material.

(2) Increased alkalinity increases reactivity due to the (OH) ion being adsorbed by the solid particles, and subsequently increasing their attractive force for water.

(3) Negatively charged electrolytes promote and positively charged prevent congealing as a result of their opposite forces. Material such as slag slurry has the capacity for adsorbing ionic charges, either positive or negative. Positive ions reduce interfacial tension and permit contraction of the particles. Negative ions increase interfacial tension and force the particles further apart.

(4) Calcium chloride, a negatively charged electrolyte, when added to congealing slurry, lowers viscosity due to its power to increase the surface tension of the water, resulting in a destruction of the outer layers of the gel particles and producing a less concentrated solution. This reaction acts as a shock to the slurry, but the following adsorption of the negative ions from the chloride by the solid particles results in a further and more rapid rate of colloidal formation or congealing.

(5) Agitation is necessary to increase volume, as a result of the mass power of attraction exerted by the solid particles upon each other when in the presence of a negative charge and low water concentration. When agitated, and therefore separated, their attractive force is exerted upon the excess water. When congealing has progressed, a very fine network of extremely small crystals has been developed between which is held the water. When the positive ions are added and adsorbed, the rigidity of the entire structure is destroyed resulting in more flexibility between individual crystals, and therefore lower viscosity. If not agitated and broken, however, this fine network retains its original form and the apparent original volume remains.



Effect of reagents of opposite sign on swelling or volume change. Left to right — Straight slurry, no agitation; straight slurry, agitated; CO_2; phenol; $CaCl_2$; $Ca(OH)_2$

Theory of the Congealing of Blast-Furnace Slag Slurry

Blast-furnace slag slurry possesses all of the requirements for a colloidal condition, as the solids are in a very fine state of subdivision and in a liquid medium of water. In this respect the oxide compounds of calcium silicate and aluminate are particularly active. As a result of the hydration of the calcium sulphide, which is always present in such slag to a greater or lesser extent, a so-

lution of a negatively charged electrolyte is produced, that transfers its ionic charge to the solids. This adsorbed charge forces the particles further apart, developing a porous network of extremely small crystals or micelles. The micelles owe their charge, stability, and power to attract and retain water at their interfaces to the adsorbed negative ions. An increase in the content of the soluble negative electrolyte is a factor in the rapidity of the initial, and degree of the final state of congealing. Increased temperature increases the rate of congealing. As a result of the increased rate of reaction between water and calcium sulphide, which produces the negative electrolyte in a lesser length of time. Recalling at this time the results obtained in Series No. 8, sufficient evidence of the effect of temperature in the presence of an excess of positive ions was established to substantiate conclusions that the negative ions must be present in excess before the congealing action will occur.

The green color attained in congealed slurry is no doubt due to a complex compound containing sulphur and iron. This color will not be attained unless iron is present and will be destroyed when the sulphur is volatilized.

* * *

It may be interesting to note, when in the presence of certain electrolytes, the possible analogy between slag slurry and portland cement, in the physical forces exerted to produce setting and hardening.

Search for Soviet Phosphate Deposits

POSSIBLE SOURCES of phosphates in Russia so far have not been thoroughly investigated, according to A. D. Arkhangelskii. A thorough study is recommended, especially in Crimea, Caucasus and Turkestan, not only of known types of deposits, but also of general distribution of phosphates in sedimentary rocks. Most of the deposits known at present are of low P content and are scattered among other minerals over a large area in thin layers. Formation of phosphates from limestones by means of reaction with NH_4 phosphate originating from guano is outlined, and possibility of this phenomenon in Russia given consideration.—*Chemical Abstracts.*

Lime Additions to Friable Clay

ADDITIONS OF LIME to soil in quantities predetermined from titration curves to produce p_H changes up to 5.6 effected the calculated changes. To bring about p_H 6 in the field, 1.6 times the quantity of lime calculated from laboratory tests was required. It was impossible in the field to bring the p_H value to 7.0. The most heavily limed areas of this soil rapidly developed further acidity.—*Chemical Abstracts.*

Fuller's Earth in 1930

THE FULLER'S EARTH sold or used by producers in the United States in 1930 amounted to 335,644 short tons, valued at $4,326,705, as announced by the United States Bureau of Mines, Department of Commerce. This is an increase of 6% in quantity and a small increase in total value in comparison with 1929. Georgia was the leading producing state in 1930. Florida was second and Texas third, the latter taking over the rank held by Nevada in 1929. These three highest ranking states in 1930 produced 82% of the total output. The average value per ton of fuller's earth was $12.89 in 1930 compared with $13.64 in 1929.

Fuller's earth is a term used to include a variety of natural substances that possess the property of absorbing grease or clarifying, bleaching or filtering oil. The original use of fuller's earth was in the fulling of cloth, but little of it is now used for this purpose. It is used almost exclusively in the bleaching or filtering of mineral and vegetable oils and animal fats, more than 99% of the domestic output being used for these purposes in 1930; the remainder was used as a filler, a binder, for fulling cloth, etc.

In 1930 the imports of fuller's earth were 7818 short tons, valued at $156,520, a decrease of 6% in quantity but an increase of 3% in value as compared with 1929.

Seven producers reported to the Bureau of Mines that in 1930 they exported 14,237 short tons of fuller's earth, which was a decrease of 33% in comparison with 1929.

Unemployment in the Building Industry

UNEMPLOYMENT in the building industry was to be discussed by delegates representing the building business of the world at a conference to be held under the auspices of the International Federation of Building and Public Works at Berlin, Germany, June 25 and 26.

Delegates represented the Associated General Contractors of America.

It was hoped that the Berlin conference might develop a program that will be helpful to all countries and particularly to the industry in the United States.

Ask Cut in Feldspar Tariff

THE TARIFF COMMISSION announces that it has instituted investigations with respect to feldspar, crude and ground. The request for the investigation into crude feldspar comes from the Consolidated Feldspar Corp., East Liverpool, Ohio, and asks a decrease in duty. All parties interested will be given opportunity to present evidence in the investigation to be held at the office of the commission in Washington, D. C., or at such other place or places as the commission may designate, on a date not yet fixed.

Fertilizer Trade Accepts New Trade Code

IN CONVENTION at White Sulphur Springs, W. Va., June 8-11, the National Fertilizer Association voted to accept the industry's trade practice rules as amended by the Federal Trade Commission, although little remains of the code originally approved by the commission in 1929. Manufacturers were outspoken in criticizing the extreme revision and Charles J. Brand, executive secretary, was instructed to advise the commission that the association regards the action taken without consulting the industry as arbitrary and improper. A concrete statement of what constitutes secret rebating in the fertilizer industry has been sacrificed in the commission's heavy-handed reversal of its previous policy of cooperating with industry in the elimination of unfair and uneconomic trade practices. The rebate rule is now reduced to language so general that it loses its force as a guide. The new code contains only three other rules. The sale of goods below cost with the intent and effect of injuring a competitor and defamation of competitors are declared to be unfair trade practices. The commission accepted as an expression of the trade a rule condemning the withholding from or insertion in invoices of statements that make such invoices a false record.

It was also reported that because of the unfavorable out-turn of the season, the tonnage of fertilizer consumed in 1931 will average 25% less than in 1930. Consumption in the southwest is reported to be 53% off.

Bayless W. Haynes, president of the Wilson and Toomer Fertilizer Co., Jacksonville, Fla., was elected president of the association. John J. Watson, president of the International Agricultural Corp., New York, N. Y., was elected vice-president, and Charles J. Brand was re-elected executive secretary and treasurer. New members of the board of directors are: W. L. Waring, Jr., Lyons Fertilizer Co., Tampa, Fla.; E. L. Robins, president of the Meridian (Miss.) Fertilizer Works; S. J. Martenet, E. Rauh and Sons Fertilizer Co., Indianapolis, and John J. Watson.—*Chemical and Metallurgical Engineering.*

New Lime Plant in Tennessee

THE COLUMBIA Lime Manufacturing Co. is the latest enterprise of Columbia, Tenn., opening recently at the Columbia brick manufacturing plant in Riverside, with a capacity of 20,000 bbl. per day.

This lime kiln, owned and operated by Robert Lee Vaughan, Jr., and Dixon Sowell, will employ 15 men.

This is the first lime kiln to be operated in Columbia in the past 10 years. Previous to that time kilns were operated here for nearly 100 years.—*Columbia* (Tenn.) *Herald.*

Hints and Helps for Superintendents

Enlarging Stone Storage

AT THE Holston Quarry Co., Liberty, S. C., plant, stone is given its final screening in a high tower above a long conveyor gallery from which the sized materials are chuted to a row of ground storage piles, says a recent issue of *Sauerman News*. A second belt running in a tunnel reclaims from the storage piles and, by withdrawing from the different piles as desired, feeds the stone to a loading plant in any proportions.

An auxiliary to this "live storage" system is a ¾-cu. yd. Sauerman drag scraper which spreads the stone from under the conveyor gallery to the ground on either side to enlarge the reserve storage, and later drags it back over the tunnel when needed to fill orders. By moving the guide blocks that control the operating span, the scraper can be shifted to handle material from or to any of the various piles.

Storage piles are spread over large area

Drag scraper spreads the stone

Lubricating Open Gears

By G. H. Olson
Manager Crane and Shovel Division, Link-Belt Co., Chicago, Ill.

OPERATORS OF CRANES, excavating and other machinery will find the following home-made mixture an especially efficient lubrication for open gears:

White lead	½ lb.
Cylinder oil	½ gal.
Flake graphite	½ lb.

It will be found that this mixture adheres well to the gears and that it can be painted on with a brush, as required, at intervals of about five hours.

The graphite and oil form the lubricating content of this mixture. The lead acts as a binder and keeps the gears from cutting.

Cup grease may be substituted for the cylinder oil. The graphite may be omitted, but it is not advisable in warm weather.

Some of the standard gear compounds may be used with good results, but they have a tendency to run off the gears and get in the frictions of excavating machinery, usually resulting in a dirty machine. However, most of these compounds may be obtained in grades that are suitable for use in various temperatures.

The white lead mixture may be made heavier for warm weather by using less oil or grease in proportion to the quantity of flake graphite.

Above all, keep all moving parts properly lubricated for increased life and efficiency.

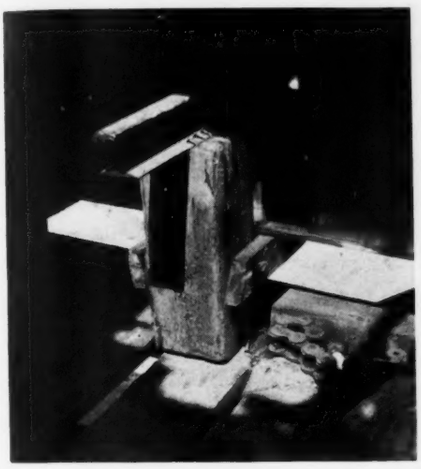
Drain for Dewatering Gravel in the Storage Bin

WHERE there is a considerable amount of water left in the gravel deposited in bins it is desirable to have some means of draining off this water. A vertical drain placed against one side of the bin, as illustrated, is a cheap and effective means of permitting the water to drain off. This drain consists of two pieces of 2x6 timbers, braced about 4 in. apart, and finished with a wire mesh screening across the open face that protrudes into the bin. The screen used is a heavy ⅜-in. mesh. The drain connects at the bottom with a hole cut through the floor of the bin, or there may be some other convenient method of carrying the water away.

Drain passes from top to bottom of the bin

Inexpensive Anvil for the Top of the Plant

SPLICING SMALL BELTS, adjusting metal chutes and similar small jobs are frequently done in the plant itself instead of down in the regular plant shop on the ground. To facilitate such jobs a small anvil at some convenient location near the top of the plant can be readily installed and will save considerable time.



Convenient anvil for light work

Such an anvil can be made by using about 18 in. of ordinary railroad rail with one end secured to a protruding beam or fastened to a heavy block and the other end extending out from the block to obtain freedom to work on it. The accompanying illustration shows such an anvil in use in a mid-west gravel plant.

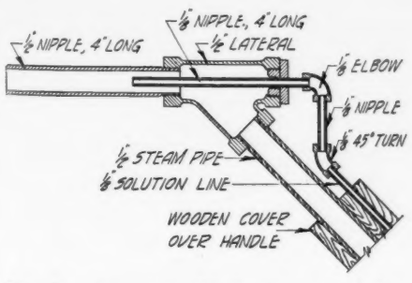
Device Cleans Paint from Metal

(Contributed)

MOST PLANTS are faced at some time with the problem of brightening up machinery and equipment that has become badly chipped or damaged. Or sometimes it is desired to have a thorough house cleaning.

The device shown has been found very useful in expediting the cleaning of machinery or in preparing it for painting.

It is a steam gun made, as shown, from pipe fittings which are found about most plants. This gun is easily handled by means of a 2½-in. handle covered with wood wrapped with asbestos and the asbestos secured to the handle with tape. Control valves are placed at the end of the handle opposite the nozzle. For general use the handle should be made four or five feet long to get the operator as far from the spray as possible. When working around machinery, however, the long handle cannot be used.



Simple, shop assembled, steam cleaning gun

Two kinds of cleaning solution may be used with this gun. One removes both dirt and paint. Another is available that removes dirt without the paint. This method of cleaning has proved much simpler than scraping and scrubbing, which is the more general method used to clean surfaces of the nature described.

New Use for Old Tires

ANOTHER use for old automobile tires has been discovered! A gravel operator has placed three tires on the underframe of his side-dump cars, to form a cushion in dumping. The illustration shows how the tires are placed.

Undoubtedly a cushion of this kind will lengthen the life of cars, and reduce breakage, and the cost of a few old casings will be practicaly negligible.

This same operator has hung heavy cloths over the journal boxes of the car, keeping sand and dust from working in the box and ruining the oil, as well as cutting the axle and end bearing. This is also shown in the accompanying illustration.

Old tires take shock in dumping load

Inexpensive Steam Line Hanger

A SIMPLE METHOD for suspending heavy steam or compressed-air lines is shown in the accompanying illustration. An inexpensive trolley device easily constructed in the local blacksmith or machine shop takes care of pipe expansion and contraction. Many semi-permanent installations do not require more elaborate or costly hangers; however, it is usually desirable to keep such steam lines well off the ground, and at the same time, to have them readily accessible for making changes or additions to the system.

Trolley provides for expansion and contraction of steam line

This steam line is anchored to the ground by cables about 12 ft. to the right of the hanger. At greater distances from points of anchorage or with very extensive lines a somewhat longer track would be necessary for the small trolley than the one illustrated.

This installation is at one of the soapstone quarries of the Virginia Alberene Corp. at Schuyler, Va. At the left is A. J. Belmore, general superintendent, and at the right is John Cartwright, quarry superintendent.

Editorial Comment

Central Selling Organizations

Undoubtedly among the subjects of livest interest to producers of rock products at this moment are the possibilities of central selling organizations, or a pooling of sales efforts and distributing facilities. Every producer in highly competitive territory is fully aware of the enormous cost to him of the competitive selling of a more or less standardized material, the waste in excess distributing equipment and facilities, etc. If only some of these selling and overhead costs could be eliminated there would be at least some chance of making a little profit!

Such central or group selling organizations in these industries are not new. They have been tried. They have proved successful in making a profit for their organizers —for short periods. All that we know of have lasted but a very few years. Several new ones recently have been formed. Several that had been operating successfully for a few years have recently disintegrated.

Apparently such sales organizations, or pools as they really are, where a number of independent producers unite to form and maintain a single cooperative sales and distributing organization, can be made entirely lawful, even in states with rigid anti-trust laws (1) if they do not include *all* the producers in the territory; (2) if they can be defended as an honest effort to introduce economy and efficiency in sales and distribution.

Naturally, they never could be organized to include every free and independent producer, for that would be contrary to the law of nature, even man-made laws permitting! They always start with some free-lance competition. Also, they usually start with the handicap of a stiffening of prices, undoubtedly economically necessary in most cases, but all too obvious evidence of the effectiveness of the organization from the viewpoint of the consumer.

The consumer's antagonism may be somewhat mollified by evidence of increased efficiency and reliability in the matter of service, or quality, or both; but even in this case when accompanied by a marked price increase, there is very apt to be considerable illwill to overcome, before the building up of permanent goodwill can be entered upon. It requires a great deal of self-control and forbearance to forego raising prices immediately as it becomes possible, but it is mighty good policy in the long run to stick to the old prices, or even lower them, for a period until the consumer part of the industry becomes accustomed to the changed conditions, or until some event or condition may justify a price increase without serious questioning of the necessity, or the motive.

Any attempt to maintain a high price for a standard commodity for the purpose of *profit only* seems foredoomed to failure by the very laws of nature. We have innumerable examples, international in the case of coffee, rubber, etc., national, as in the case of wheat, and other grains, in this country, and in the cases of many, many local price combines in a great variety of commodities. The very seeds of failure are inherent in all such schemes. There is no feasible way to control production, at least no man or government has yet found one.

And there is too much room for competition between commodities, or between industries, for successful curtailment of production by any one of them alone. If production of portland cement is curtailed to a point where its price is out of line with the prices of competitive construction materials, the producers of cement suffer from this competition, even though it were possible to prevent the entrance of new producers of cement into the industry. Ordinarily, of course, the penalty an industry pays for too profitable a price for its commodity, is the immediate entrance into the field of new producers who have no affiliations with the existing group, and who, very frequently, are encouraged, or financed by disgruntled consumers.

The foregoing is not written as a condemnation of group selling plans or of central selling and distributing organizations. As a matter of fact they seem to us about the only feasible solution for the prevention of enormous economic waste. But, on the other hand, in themselves they are by no means cure-alls. To be anywhere near successful they require the best management and directing brains the industry affords. They should not be handicapped by employment of short-sighted policies, unless they are specifically intended to exist for a short period only, and even then the wisdom of such a policy is questionable when the welfare of the future of the industry as a whole is considered.

In other words, a central sales and distributing organization must have not only the excuse of greater economy and efficiency for its existence, but it must prove to its consumers that they as well as the producers are gainers through its operation. Stabilizing of a local price structure is certainly as advantageous to the continuous consumer as to the producer, better service and better standards of quality should result, not to mention far better facilities for the extension of credit and for making collections. For all these the normal consumer is willing to pay a fair price, but not an excessive one. What constitutes a fair price in any one locality, or under any set of local conditions, is the most momentous question any management or board of directors has to decide, for group selling does not save one from the penalty for excessive greed; it may even accentuate the penalty.

But group selling schemes also come to grief from dissension within as frequently as from pressure without. They involve the proration or division of production on

some basis as nearly equitable as possible. But all operators are not alike. Some are efficient, others are not. Some producers are bound to make more money than others. Those who can't make their expected or desired profits on the production end are very apt to want to see prices increased even though they may be satisfactory to other producers. Or progressive producers may become disgusted with a price policy which protects an inefficient producer, or a producer of generally unsatisfactory material. It usually takes but one withdrawal from such a group to break it up.

So the really vital problems of a central sales organization are not selling material, distributing, credits, etc. They are the human equation problems. They are the problems of developing goodwill on the part of the consumer by every legitimate means—fair prices, quality, service, etc. They are the problems of selling the organization itself to the consumer and the public, as well as the mere selling of the commodity, which is relatively simple. The other human equation problems, of keeping satisfied and fair-minded the group of producers in the fold, obviously call for the highest degree of executive and managerial talent. But back of that talent must be absolute honesty and frankness in the dealings within the group as well as without.

So in drawing up a constitution and by-laws for a central selling organization make it a working code, as well as one that will pass the scrutiny of district attorneys. If the organization is to be defended as a public service, as it can be, start it out by honestly endeavoring to make it a public service, and all other problems will more or less take care of themselves.

Rock Products Clinic

"Diatomite as a Concrete Admixture"

THE EDITOR called the attention of the author of the article under the above title in ROCK PRODUCTS, Aug. 2, 1930, to apparent discrepancies. "In the tables of chemical analysis, Table 1 adds up to over 108% including the moisture, and in Tables 3 and 4 you have to add in the moisture content in order to get the necessary 100%.

"Evidently there is some error here and, thinking it over, I don't see why it is necessary to include moisture in a chemical analysis. No doubt, you can explain this satisfactorily, but I really think an explanation is due the readers."

The author replied: "Regarding the questions raised about the chemical analyses in Tables 1, 3 and 4. Due to the fact that I was considering the question of the iron oxide and alumina occurrences in the diatomite, I neglected to explain the chemical analyses of the various diatomites mentioned; the analysis of Table 1 shows the silica content as 95.50% which includes combined water or moisture of 8.37%, there being no free moisture in the sample, and this 8.37% should not be added to the other figures as it is in once. In tables 3 and 4 the moisture figure is for free moisture, that is, moisture that is removed at 105 deg. C. I had another purpose in mind when the analysis of Table 1 was made so the occurrences were reported differently; I am sorry that this explanation was not made by me in the article.

"I agree with you that moisture content is of secondary interest in a chemical analysis; cannot see much use for it myself.

"Answering your query regarding the water cement ratio mentioned in the tables. The water cement ratio was kept constant, making no allowance for the amount absorbed by the diatomite; how does a diatomite that absorbs a certain amount of water reduce the water cement ratio? The water is there, and the point I have always taken is that it is made available as the cement hydrates to concrete; the amount absorbed by the diatomite causes an apparent change in the consistency of the concrete mass—I say apparent because the workability is improved, if anything; many experiences of this nature have shown me how prone the average operator is to characterize a mix as dry when it so appears, although the flowability is some 20% greater than normal.

"It does not follow from this that the diatomite with the greatest absorptive powers has the most beneficial effect in concrete; the absorptive power of the diatomite simply means that the diatomite takes up the water, only to give it back to the mix later in the hydration period."—ELLIOTT S. HASTINGS, Los Angeles, Calif.

Texas Truck Law Test

AN IMMEDIATE TEST is to be made in the courts of the constitutionality of the new motor truck law which fixes the maximum weight loads of trucks at 7000 lb. and which contains regulatory restrictions. There is a conflict of legal opinion as to whether the new law went into immediate effect on its enactment or whether it becomes effective ninety days after adjournment of the legislature, which would make the date August 22.

Motor truck operators have asserted that should the law stand the test in the courts it will make necessary the junking of approximately $200,000,000 of bus and truck equipment used in Texas.

No Very High Regard for Railway Industrial Departments

THE EDITOR: I was a bit amused with your "Rock Products Clinic" May 23, and the exchange with Mr. Downs of the Illinois Central railroad. He has not answered your inquiry, and I wonder why he did not refer your inquiry to his industrial experts.

Your inquiry of Mr. Downs goes right to the point, and it is exactly what I have been contending with some other parties, who thought they wanted a survey of the same kind. I have pointed out that it is more important to have some one around to adequately plan industrial development, and who can work out the very problem that you have been outlining to Mr. Downs. It is not enough to know that you have a resource, but you must also know whether it should be exploited, and how it can be exploited at a profit to all concerned. This explains the grievous errors that come with half-baked direction of industrial surveys. The railroads and power companies are "babes-in-the-woods" on this subject, because they are undermanned, underpaid, and wasteful in handling this department, or arranging its control.

What About Mineral Resources?

If it is not that, they do not even have a mineralogical survey, but instead exploit only the agricultural end of the Industrial Department along with location of manufacturing concerns. They do not know what is underground, and as a natural result the information in the hands of the railroads and power companies, with but few exceptions, is a hodge-podge of miscellaneous information about everything except mineral resources. WM. H. HARRISON.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	6-30-31	95	100	
Alpha P. C. new com.[2]	6-27-31	13	16	25c qu. July 25
Alpha P. C. pfd.[2]	6-27-31	110	120	1.75 qu. June 15
Amalgamated Phosphate Co. 6's 1936[19]	6-27-31	99½	100½	
American Aggregates com.[10]	6-27-31	4	8	75c qu. Mar. 1
American Aggregates pfd.[10]	6-27-31	70	75	1.75 qu. July 1
American Aggr. 6's w.w.[19]	6-27-31	60	66	
American Aggr. 6's ex. w.[19]	6-27-31	58	64	
American Brick Co., sand-lime brick	5- 4-31		7	25c qu. Feb. 1, '30
American Brick Co. pfd.	5- 4-31	52¼	57	50c qu. May 1, '30
Am. L. & S. 1st 7's[19]	6-27-31	96	99	
American Silica Corp. 6½'s[39]	6-30-31	No market		
Arundel Corp. new com.	6-29-31	37	37⅛	75c qu. July 1
Beaver P. C. 1st 7's[20]	6-26-31	80	85	
Bessemer L. & C. Cl. A[4]	6-25-31	18	20	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	6-25-31		67	
Bloomington Limestone 6's[37]	6-30-31	49	51	
Boston S. & G. new com.[37]	6-27-31	8½	10½	15c qu. July 1
Boston S. & G. new 7% pfd.[37]	6-27-31	37½	41	87½c qu. July 1
California Art Tile A[9]	6-25-31		5	43¾c Mar. 31
California Art Tile B[40]	6-25-31	2	5	20c qu. Mar. 31
Calaveras Cement com.	6-24-31		5	
Calaveras Cement 7% pfd.	6-24-31		70	1.75 qu. July 15
Canada Cement com.	6-29-31	11½	12	
Canada Cement pfd.	6-29-31	90	91¼	1.62½ qu. June 30
Canada Cement 5½'s[42]	6-25-31	98	99	
Canada Cr. St. Corp. bonds[42]	6-25-31	89		
Canada Crushed Stone pfd.[41]	6-25-31		74	
Certainteed Prod. com.	6-29-31	5¼	5½	
Certainteed Prod. pfd.	6-29-31	18	25	1.75 qu. Jan. 1
Cleveland Quarries	6-29-31		65	75c qu. June 1
Columbia S. & G. pfd.	6-16-31	92¼	94	
Consol. Cement 1st 6½'s, A[44]	6-30-31	15	25	
Consol. Cement notes, 1941[27]	6-30-31	22	25	
Consol. Cement pfd.[27]	6-30-31	20	30	
Consol. Oka S. & G. 6½'s[12] (Canada)	6-25-31	99	101	
Consol. Rock Prod. com.[9]	6-25-31	50c	75c	
Consol. Rock Prod. pfd.[9]	6-25-31	4½	5	43¾c qu June1,'30
Consol. Rock Prod. units	6-29-31	5	7	
Consol. S. & G. pfd. (Can.)	6-29-31	65		1.75 qu. May 15
Construction Mat. com.	6-29-31	6	9	
Construction Mat. pfd.	6-29-31	27	28	87½c qu. May 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	6-25-31	65	70	
Coosa P. C.1st 6's[27]	6-30-31	42	47	
Coplay Cem. Mfg. 1st 6's[19]	6-27-31	60	70	
Coplay Cem. Mfg. com.[33]	6-13-31	5	7½	
Coplay Cem.Mfg. pfd.[33]	6-13-31	25	40	
Dolese & Shepard	6-29-31	39	43	$1 qu. July 1
Dufferin Pav. & Cr. Stone com.	6-29-31	6	7	
Dufferin Pav. & Cr. Stone pfd.	6-29-31	68¼	72½	1.75 qu. July 2
Edison P. C. com.[32]	6-25-31	1½		
Edison P. C. pfd.[32]	6-25-31	5		
Federal P. C. 6½'s, 1941[19]	6-27-31	95	100	
General Aggr. Corp. 6½'s[38]	6-24-31	97½	98½	
General Aggr. Corp. com.[38]	6-24-31	9	10	25c qu. July 15
Giant P. C. com.[2]	6-27-31	2	4	
Giant P. C. pfd.[2]	6-27-31	5	10	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	6-29-31	8¾	9	20c qu. June 30
Hermitage Cement com.[21]	6-27-31	15	25	
Hermitage Cement pfd.[11]	6-27-31	70	80	
Ideal Cement, new com.[29]	6-26-31	30	34	75c qu. July 1
Ideal Cement 5's, 1943[29]	6-26-31	99	101	
Illinois Electric Limestone 1st 7's[38]	6-24-31	95	100	
Indiana Limestone com.[27]	6-30-31		3	
Indiana Limestone pfd.[27]	6-30-31		50	
Indiana Limestone 6's	6-26-31	34¾	35	
International Cem. com.	6-29-31	34	35	$1 qu. June 30
International Cem. bonds 5's	6-29-31	87½		Semi-ann. int.
Iron City S. & G. bonds 6's[36]	6-26-31	80	90	
Kelley Is. L. & T. new stock	6-29-31	27½	30	50c qu. July 1
Ky. Cons. St. V. T. C.[38]	6-24-31	4	5	
Ky. Cons. Stone 6½'s[38]	6-24-31	82	88	
Ky. Cons. Stone com.[38]	6-24-31	4	5	
Ky. Cons. Stone pfd.[38]	6-24-31	80	85	1.75 qu. May 1
Ky. Rock Asphalt com.[13]	6-27-31	4¼	5½	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	6-27-31	65	70	1.75 qu. June 1
Ky. Rock Asphalt 6½'s[13]	6-27-31	85	90	
Ky. Rock Asphalt war.[45]	6-29-31	3	5	
Lawrence P. C.[2]	6-27-31	40	45	$1 qu. June 30
Lawrence P. C. 5½'s, 1942[2]	6-27-31	82	84½	
Lehigh P. C.	6-29-31	10½	11½	25c qu. May 1
Lehigh P. C. pfd.	6-29-31	88¼	96½	1.75 qu. July 1
Louisville Cement[45]	6-29-31	175	225	
Lyman-Richey 1st 6's, 1932[13]	6-25-31	95		
Lyman-Richey 1st 6's, 1935[13]	6-25-31	92		
Marblehead Lime 6's[14]	6-25-31	No market		
Marbelite Corp. com.[20] (cement products)	6-26-31	No market		
Marbelite Corp. pfd.[20]	6-26-31	1		50c qu. Oct. 10, '30
Material Service Corp.	6-27-31	18	20½	50c qu. June 1
McCrady-Rodgers 7% pfd.[22]	6-24-31	47	50	87½c qu. June 30
McCrady-Rodgers com.[22]	6-24-31	15	20	75c qu. Jan. 26
Medusa Portland Cement	6-29-31	31	36	75c qu. Apr. 1
Michigan L. & C. com.[6]	6-27-31	45		
Missouri P. C.	6-29-31	21	21½	50c qu. July 31
Monolith Portland Midwest[9]	6-25-31	1	1½	
Monolith P. C. com.[9]	6-25-31	1	2	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	6-25-31	2	3	40c s.-a. Jan. 1
Monolith P. C. units[9]	6-25-31	5	7	
Monolith P. C. 1st Mtg. 6's[9]	6-25-31	73	77	
National Cem.(Can.) 1st 7's[27]	6-30-31		99	
National Gypsum A com.	6-29-31	4	4¾	
National Gypsum pfd.	6-29-31	39	42	$1 Apr. 1
Nazareth Cement com.[25]	6-11-31	10	12	
Nazareth Cement pfd.[25]	6-11-31	80	85	
Newaygo P. C. 1st 6½'s[27]	6-30-31	97	99	
New England Lime 6's, 1935[19]	6-27-31	40	60	
N. Y. Trap Rock 1st 6's	6-29-31	93½	94¼	
N. Y. Trap Rock 7% pfd.[30]	6-29-31	95		1.75 qu. July 1
North Amer. Cem. 1st 6½'s	6-29-31	40½ act. sale		
North Amer. Cem. com[27]	6-30-31	1	2	
North Amer. Cem. 7% pfd.[27]	6-30-31	10	13	
North Shore Mat. 1st 5's[15]	6-30-31	90		
Northwestern States P. C.[31]	6-29-31	95		$2 Apr. 1
Ohio River Sand com.	6-29-31		14	
Ohio River Sand 7% pfd.	6-29-31		98	
Ohio River S. & G. 6's[16]	6-24-31	80	88	
Oregon P. C. com.[9]	6-25-31	8	12	
Oregon P. C. pfd.[9]	6-25-31	80	85	
Pacific Coast Aggr. com.[40]	6-25-31		1	
Pacific Coast Aggregates pfd.	6-29-31		1½	
Pacific Coast Cement 6's[5]	6-12-31	64½	74½	
Pacific P. C. com.[5]	6-12-31	14¾	17¾	
Pacific P. C. pfd.	6-24-31		67½	1.62½ qu. July 3
Pacific P. C. 6's[5]	6-12-31	97¼	97¾	
Peerless Cement com.[1]	6-27-31	1⅜	1¾	
Peerless Cement pfd.[1]	6-27-31	30	40	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	6-29-31	2¾	2⅞	
Penn.-Dixie Cement pfd.	6-29-31	11⅛	15	
Penn.-Dixie Cement 6's	6-29-31	60 act. sale		
Penn. Glass Sand Corp. 6's	6- 3-31	100	102	
Penn. Glass Sand Corp. pfd.	5- 6-31	90		1.75 qu. July 1
Petoskey P. C.	6-29-31	3½	4½	15c qu. Apr. 1
Port Stockton Cem. com.[9]	6-25-31	No market		
Riverside Cement com.	6-24-31		13	
Riverside Cement pfd.[20]	6-26-31	57	60	1.50 qu. May 1
Riverside Cement, A[20]	6-26-31	5	8	15c qu. Feb. 1
Riverside Cement, B[20]	6-26-31	75c	1	
Roquemore Gravel 6½'s[17]	6-27-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	6-27-31	90	101	
Santa Cruz P. C. com.	6-24-31	84		$1 qu. July 1
Schumacher Wallboard com.	6-24-31	6	11	25c qu. June 27
Schumacher Wallboard pfd.	6-24-31	12½	20	50c qu. May 15
Southwestern P. C. units[35]	6-25-31	245		
Standard Paving & Mat. (Canada) com.	6-29-31	8	8¾	50c qu. May 15
Standard Paving & Mat. pfd.	6-29-31		75¼	1.75 qu. May 15
Superior P. C., A[20]	6-26-31	35	40	27½c mo. July 1
Superior P.C., B[20]	6-26-31	11½	13	25c qu. Mar. 20
Trinity P. C.units[31]	6-29-31	105		
Trinity P. C. com.[31]	6-29-31	20		
Trinity P. C. pfd.[27]	6-30-31	95	100	
U. S. Gypsum com.	6-30-31	40	40½	40c qu. June 30
U. S. Gypsum pfd.	6-30-31	129½	130	1.75 qu. June 30
Wabash P. C.[21]	6-27-31		21	
Warner Co. com.[16]	6-24-31	24	27	25c qu. July 15
Warner Co. 1st 7% pfd.[16]	6-24-31	90	95	1.75 qu. July 1
Warner Co. 1st 6's[3]	6-30-31	88¼	88¾	
Whitehall Cem. Mfg. com.[30]	6-29-31	80		
Whitehall Cem. Mfg. pfd.[30]	6-29-31	50		
Wisconsin L. & C. 1st 6's[15]	6-30-31	90		
Wolverine P. C. com.	6-29-31	1¾	2⅝	15c qu. Nov. 15
Yosemite P. C., A com.[9]	6-25-31		10	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomas & Co., Montreal. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky.

Schumacher Wall Board Corp. Report

THE SCHUMACHER WALL BOARD CORP., San Francisco, Calif., for the year ended April 30, 1931, reports net profit of $78,362 after depreciation, federal taxes and deduction of non-recurring charges, equal after $60,344 dividend requirements on the 30,172 preferred shares outstanding at the close of the period, to 27c a share on 66,000 outstanding shares of common stock. For year ended April 30, 1930, the company reported net profit of $163,206, equal after $66,000 preferred dividends, to $1.47 a share on 66,000 common shares.

The report of A. R. Moyland, vice-president and general manager, points out that sales volume of the company last year declined only 4% below that of 1930 and 9% below 1929, in the face of 46% decline in building permits in the company's territory.

The Schumacher corporation's subsidiary, the Gypsum Products Corp. of Seattle, however, suffered losses so considerable that Schumacher was compelled to increase its investment and take over active management. As of October, 1930, the holdings were increased to 66 2/3% from 50% in common stock of Gypsum, and the company now is on a profitable basis, Mr. Moylan says.

During the year Schumacher's directors purchased and retired 2828 shares of preferred stock. Dividend payments on common stock, at the rate of 25c quarterly, were inaugurated in March and, according to Mr. Moylan's letter, the expectation of the management is that earnings will justify a continuance of those payments.

Balance sheet as of April 30 compares as follows:

ASSETS

	1931	1930
Current assets	$ 255,774	$ 304,439
Investments	271,437	200,073
Fixed assets, net	1,310,408	1,389,277
Deferred charges	134,126	144,239
Total assets	$1,971,747	$2,038,028

LIABILITIES

Current	$ 165,133	$ 99,760
Capital stock	1,644,041	1,727,596
Surplus	162,571	210,672
Total liabilities	$1,971,747	$2,038,028

Paraffine Cos., Inc., stands to benefit to the extent of $16,675 a year, from the dividend announced by the Schumacher Wall Board Corp. The company's initial quarterly dividend on common stock last March, of 25c a share, was followed by the declaration of the second quarterly common dividend of 25c, payable June 27 to stock of record June 17. No common dividend was paid in 1930.

Paraffine Cos. at present holds 16,675 shares of Schumacher common, having augmented its holdings by 1675 shares during the last fiscal year of Schumacher, which ended April 30, 1931. On the amount of stock now held by Paraffine, the undistributed equity shown by Schumacher for the year ended April 30 was $4504.

Kentucky Rock Asphalt Statement

THE Kentucky Rock Asphalt Co., Louisville, Ky., reports earnings and balance sheet as follows:

Calendar Years:	1930	1929
Net operating profit	$ 562,364	$ 520,760
Other income (net)	36,091	31,187
Total income	$ 526,273	$ 489,573
Interest on first mortgage bonds	66,605	67,307
Depreciation and depletion	109,595	106,804
Income taxes accrued	43,000	34,258
Net available for dividends	$ 307,073	$ 281,204
Preferred dividends	91,322	91,322
Net available for common stock	$ 215,751	$ 189,882
Shares of common stock outstanding (no par)	126,819	126,793
Earnings per share	$1.70	$1.49

CONDENSED BALANCE SHEET, DECEMBER 31

Assets:	1930	1929
Cash	$ 158,425	$ 88,610
Accounts and notes receivable	357,928	390,057
Inventories	276,741	422,824
Expense paid in advertising	379,903	318,922
Deposit in Bank of Tennessee	200,000	.....
Sinking fund uninvested	3,033	2,658
Fixed assets	4,876,025	5,093,889
Organization expense	5,138	5,138
Total	$6,257,194	$6,322,099
Liabilities:	1930	1929
Notes payable	.....	$ 50,000
Accounts payable	$ 50,865	48,505
Accrued interest payable	5,100	5,679
Reserve for income taxes	43,982	34,258
First mortgage 6½% bonds	941,500	1,035,500
6% notes due 1931	200,000	200,000
Preferred stock	1,304,600	1,304,600
Common stock	3,156,674	3,156,299
Undivided profits	531,081	465,410
Barge insurance fund	23,392	21,849
Total	$6,257,194	$6,322,099

Kentucky Consolidated Stone Balance Sheet

THE Kentucky Consolidated Stone Co., Louisville, Ky., reports a balance sheet as of April 30, 1931, as follows:

Assets:	1931	1930
Property account	$4,108,125	$4,751,521
Current assets:		
Cash		38,000
Securities		19,000
Bills & acts. rec. (net)	152,510	200,469
Inventories		34,300
Sinking funds	3,654	.....
Other asstes	12,061	16,429
Development	445,900	.....
Deferred charges, etc.	168,695	186,050
Total	$4,890,946	$5,245,769
Liabilities:		
Preferred stock	$ 517,300	$ 552,200
Common stock & surp.	3,513,734	3,686,271
Mortgage bonds	775,000	889,500
Current Libilities:		
Accounts payable		90,253
Federal tax	81,911	22,900
Accruals		4,645
Reserves	3,000	.....
Total	$4,890,946	$5,245,769
Current assets	$ 152,510	$ 291,769
Current liabilities	81,911	117,798
Working capital	$ 70,599	$ 173,971

Medusa Cement Passes Common Dividend

THE Medusa Portland Cement Co., Cleveland, Ohio, has omitted the quarterly dividend of 75c on the common stock due at this time. Regular quarterly dividend of $1.50 on the preferred stock was declared, payable July 1 to stock of record June 25.

Peerless Cement Passes Preferred Dividend

AT A MEETING of the directors of the Peerless Cement Corp., Detroit, Mich., June 23, it was decided not to pay the dividend on the preferred stock of the company which would have fallen due July 1. The official announcement stated: "After carefully reviewing the present business situation and the immediate outlook, the directors deemed it wise to conserve the cash assets of the company until such time as the business situation and the outlook for the future was materially better. It is the belief of the directors that this action is for the best interests of the stockholders and that it will redound to their benefit. With an increase of business and improvement in prices, this condition will be greatly improved."

Asbestos Manufacturing Co., Ltd., Liquidates

AS A RESULT of the abnormal conditions which have reigned in the asbestos industry for the last few years, it was announced at the head office of the Asbestos Manufacturing Co., Ltd., Montreal, Canada, that it had gone into liquidation.

The necessary proceedings were initiated under the winding-up act and Messrs. Larue, Trudel and Picher were appointed temporary liquidators by Chief Justice Sir Lemieux.

While the liquidation will affect the asbestos industry, it is understood that negotiations are already in progress for a merging of some of the asbestos companies concerned.

New International Director

AT the annual meeting of International Cement Corp., R. W. Atkins resigned as a director and was succeeded by H. H. Muehlke, secretary and treasurer. Other retiring directors were re-elected.

Recent Dividends Announced

Alpha Portland Cement com. (qu.)	$0.25,	July 25
American Aggregates pfd. (qu.)	1.75,	July 1
Arundel Corp. com. (qu.)	0.75,	July 1
Boston Sand and Gravel com. (qu.)	0.15,	July 1
Boston Sand and Gravel pfd. (qu.)	0.87½,	July 1
Calaveras Cement 7% pfd. qu.)	1.75,	July 15
Dolese and Shepard (qu.)	1.00,	July 1
Dufferin Paving and Crushed Stone pfd. (qu.)	1.75,	July 2
Limestone Products 7% pfd. (qu.)	0.62½,	July 1
Medusa Portland Cement pfd. (qu.)	1.50,	July 1
Pacific Portland Cement pfd. (qu.)	1.62½,	July 3
Santa Cruz Portland Cement com. (qu.)	1.00,	July 1
Southwestern Portland Cement com. (qu.)	1½%,	July 1
Southwestern Portland Cement pfd. (qu.)	2%,	July 1

Study of Standard Portland Cements and Early Strength Cements

A CRITICAL STUDY of the cements and their concrete-making qualities used in the Kansas territory made by the Engineering Experiment Station of the Kansas State College through its road materials laboratory, the official laboratory of the Kansas Highway Commission, to determine the variations between these cements, is reported in Bulletin 26 of the Engineering Experiment Station.

The properties studied and reported were the standard chemical and physical properties, compressive and flexural strengths in mortar and concrete, the workability or consistency as expressed by slump and flow, the water-cement ratio-strength relation for each cement through a narrow range, and the mortar voids characteristics of each of 18 brands of cement studied.

While certain well-defined characteristic differences seem to be brought out by this study, the general impression from the data is that of rather unusual uniformity. The data indicates the peak of the water-cement ratio-strength relation is much broader for some brands of cement than for others. The quantity of water required to produce maximum density varied but little for most of the brands studied, the maximum variation shown being only about 20% between the high and low values.

German Standard Specifications for Portland Cement

STANDARD SPECIFICATIONS for portland cement, iron portland cement and blast-furnace cement have been established in Germany. The tensile strength test is given less weight than previously. Specifications for high early strength cements (in kg./sq. cm. for tensile and compressive, respectively) are 25 and 250 at three days with water storage and 40 and 500 at 28 days water and air storage. The three cements are on a par except as to definition.—*Chemical Abstracts.*

Mineral Resources of the United States

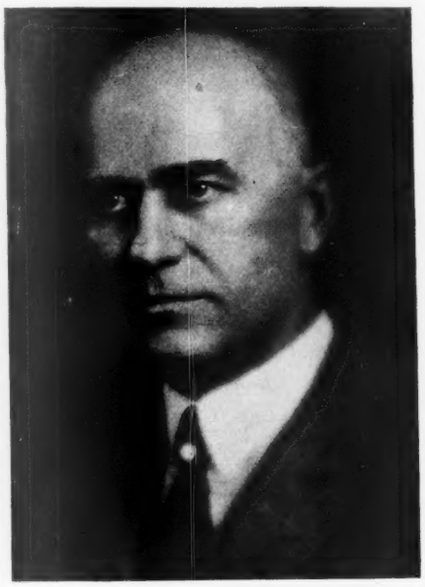
THE latest published issue of "Mineral Resources of the United States," 1928, by the Bureau of Mines, U. S. Department of Commerce, has recently been issued.

This report is issued in two parts, part 2 being devoted to nonmetals. This section is an 800-page book with general and statistical information on these minerals. It is available from the Superintendent of Documents, Washington, D. C., for $1.25.

Also of interest is the recently published 16-page section of this series on sand and gravel in 1929, which now is available.

Duff A. Abrams Establishes Research Laboratory

DUFF A. ABRAMS, president of the American Concrete Institute, has resigned as director of research, International Cement Corp., and will organize his own research laboratory in New York for studies and consultation on design and control of concrete and other materials of construction and for development work in cement, aggregates and construction equipment. His work



Duff A. Abrams

as professor in charge, structural materials research laboratory, Lewis Institute, Chicago, Ill., and later when in charge of the research work of the Portland Cement Association, put him in the front rank of authority on cement and concrete. Earlier he was on the faculty of the University of Illinois.

Publications on Illinois Geology

A LIST of publications on the geology of Illinois has recently been issued by the State Department of Registration and Education, Division of the State Geological Survey, Urbana, Ill.

This list names and briefly describes all bulletins and publications by the state on this subject, all reports of investigations, all press bulletins released, publications of the original geological surveys of Illinois, Illinois mining investigations, U. S. Bureau of Mines publications referring to Illinois or useful to Illinois industry, U. S. Geological Survey publications referring to Illinois, water supply papers, geological folios, quadrangle topographic maps and other maps of interest and value, miscellaneous papers in other publications based on data of the Illinois state geological survey, and a final index to publications by subject, county and author.

A. R. B. A. Convention Proceedings

THE PRINTED SUMMARY of proceedings of the 28th annual convention of the American Road Builders' Association held at St. Louis, Mo., January 10-17, 1931, has recently been issued.

Of interest in this report are the summary of requirements on central and truck mixed concrete in certain cities and states, which were printed in full in the January 31 issue of Rock Products, and the evaluation of low-cost surfaces for stage construction and other surfaces which shows the approximate traffic, capacity, construction and costs exclusive of grading, drainage and financing of these several road types.

Also of interest are the reports on airport drainage and surfacing, surface texture suitable for various types of hard surface runways, central and truck mixed concrete, new developments in city paving work, pavement bases and subgrades, standardization of weighing devices for concrete aggregates and surfacing low cost roads.

Many other subjects are discussed in this 525-page report and illustrations are shown of various types of road and street work.

Zirconium—A Sand Product

BEFORE the World War the use of zirconium and its compounds was largely experimental and confined almost entirely to Germany and Austria. During the war, and since, the United States Government and certain commercial organizations have carried on investigations and limited production and use has been developed, says Information Circular 6455, recently issued by the U. S. Bureau of Mines.

This circular says the oxide is the most important of the various compounds of zirconium.

The most important use of the oxide is as a refractory material. Next in importance is its use as an opacifying agent, especially in enamel ware, as a substitute for tin oxide. Its use for the same purpose in lacquers and automobile enamels seems to be of increasing importance. Made in brick form as a refractory, the softening temperature is said to be 900 deg. higher than that of fireclay and 600 deg. higher than that of carborundum. It is also made for this use in the form of a cement.

Zirconium minerals are widely distributed, but commercial deposits are said to be few. The only commercial operation reported in the United States was at Mineral City, Jacksonville Beach, Fla., although other deposits of such sands are reported to exist elsewhere along the Atlantic coast and in the black sands found along the Pacific coast. Most of the world's production has come from Brazil, where a number of types of deposits exist. Another source is the beach-sand deposit in the Travancore State, India.

New West Coast Cement Plant to Make Quick-Hardening Cement

DETAILS of the organization and financing plans of the San Jose Cement Co., Ltd., have become available with the formal application of the company to the California Corporation Department to sell its stock. Authorized capital consists of 225,000 shares of prior preferred stock, 200,000 shares of participating preferred and 1,500,000 shares of common. All stock is $10 par, total capitalization, therefore, amounting to $19,250,000.

The company has acquired and intends to buy more land near the station of Mercury, in Santa Clara county. This land has extensive deposits of limestone, plentiful water and is served by a branch line of the Southern Pacific. A modern cement plant will be constructed where it is planned to manufacture high-early-strength cement.

Money from the sale of stock will be used to purchase machinery, construct the plant, and to provide working capital.

The California Corporation Department has given the company permission to sell all of its prior preferred stock—225,000 shares—and 225,000 shares of common stock, in units of one and one, at $10 a unit. Also to sell 170,000 shares of participating preferred and 85,000 shares of common stock, in units of two and one, at $20 a unit. Permission also was given the company to offer for sale any portion of its authorized units to manufacturers, contractors and others as consideration for machinery to be furnished the company.

Current land holdings consist of 1179 acres about eight miles south of San Jose. The property is in three parcels but not widely separated and acquisition of additional land is contemplated.

Water for the new plant will be received from Guadalupe creek and the plant will be built adjacent to the New Almaden branch of the Southern Pacific.

The board of directors of the new company consists of Ernest H. Dettner, Dr. Bruno Bruhn, Dr. Mark F. Hopkins, Vincent Gerdeau, Wendell C. Thomas, Irwin H. Rice, F. L. Burnell, Herbert L. Hatch and Thomas J. Benney.

Mr. Dettner is president and chairman of the executive committee, Dr. Bruhn is first vice-president and consulting engineer and Dr. Hopkins is second vice-president and treasurer.

In its application to the corporation department the company said: "There are no other deposits of limestone of comparable quality and extent so conveniently located with reference to rail transportation and northern California markets, and at the present time there are no cement plants on the Pacific coast which are equipped as this company's plant will be for the manufacture of high-early-strength cement. The company plans to manufacture cement which is capable of passing all trade inspections in 24 to 48 hours after being poured into molds." —*Pacific Coast Edition of the Wall Street Journal* (San Francisco, Calif.)

* * * * *

Commenting on this project editorially the *Wall Street Journal* says:

New Cement Company Facing Test

The new San Jose Cement Co., Ltd., plans and capitalization details of which are carried elsewhere in this edition, is embarking with apparent confidence in an industry that has been notoriously unprofitable the last few years. However, if its allegations are correct, there appears to be a field for its product. So-called quick hardening cement will be manufactured by the new company exclusively. And this product now commands a premium over the ordinary portland cement. Initial capacity of the new plant will be 3,500 bbl. daily.

Bell Cement Plant Foes Win

SIGNATURES to the referendary petitions against the Bell cement plant ordinances in the Santa Monica mountains are sufficient, Los Angeles City Clerk Dominguez reported June 12 to the city council, to require the alternative of submitting the proposition to a vote of the people at the next city election or repealing the measures.

This result is regarded as a great victory for the organizations and individuals opposing the invasion of this exceptional residential area by industry.

The Dominguez reports were referred by the council jointly to the city planning and legislative committees.

In his report Dominguez traces the erratic course of the referendary petitions. They were filed in his office March 15, 1930. Due to asserted mistakes and errors in circulating the petitions, 17,824 names were thrown out, leaving 25,511, an insufficiency for the purpose. George W. Ley, a property owner opposing the Bell invasion, brought suit to test the decision, which eventuated May 1, last, in the supreme court directing Dominguez to construe the petitions liberally.

Dominguez thereupon counted names of voters with wrong precinct numbers, no precinct numbers, married women using initials of husbands and similar minor defects. He found and reported that the petition against the ordinance creating the spot industrial zone carried 30,066 valid names, and the petition against the residential exception ordinance 29,054 valid signatures.

This brought both petitions up to between 10 and 15% of the vote cast for mayor at the last general city election and, according to Assistant City Attorney Neal, the council must order the ordinances submitted at the next general election or repeal them.—*Los Angeles* (Calif.) *Times.*

To Investigate Baltimore, Md., Cement Purchases

INVESTIGATION into the methods employed and prices paid by the Baltimore, Md., city's purchasing bureau has turned to cement purchases, it was understood at the city hall recently.

Herbert Fallin, chief of the bureau of disbursements, one of the investigators named by the mayor, was assigned the purchasing department as his field of operations. Mr. Fallin has made one report to the mayor and now is engaged upon a second. It is in this second that some analysis of the city's cement-buying methods is expected.

So far as can be learned there are two concerns which sold the bulk of the cement to the buying bureau. With one of these concerns, William F. Broening, Jr., son of the former mayor, was associated. When, however, Mr. Broening, Sr., ran for the governorship it was announced that Mr. Broening Jr.'s association with the concern in question had been terminated.

Prices charged by the two companies which supplied the bulk of the cement bought by the city are understood to have been in line with current market quotations, but questions have arisen as to why two concerns should get most of the business and also whether purchases of large quantities of cement by competitive bidding rather than in less than $500 lots would not have been to the city's advantage.

Answers to these questions are expected in the second Fallin report.—*Baltimore* (Md.) *Post.*

Charles S. Kanzig Appointed Medusa District Manager

THE Medusa Portland Cement Co., Cleveland, Ohio, announces the appointment of Charles S. Kanzig as district sales manager of their Chicago metropolitan territory.

Mr. Kanzig has been associated with the Manitowoc Portland Cement Co., Manitowoc, Wis., from the time of its inception and when it became a unit of the Medusa Portland Cement Co. he became a member of that organization.

Lehigh Adds Filter at Mason City, Ia.

THE Lehigh Portland Cement Co. has completed a $160,000 reconstruction program on its Mason City, Ia., plant, which started operating again July 1.

The Lehigh plant ran throughout the winter months and shut down for repairs and installation of new equipment on May 1.

The new equipment consists chiefly of filters to reduce the moisture in the slurry. This installation followed as a logical sequence of the change to the wet process instituted a short time ago.—*Mason City* (Ia.) *Globe-Gazette.*

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended May 30	Sand, Stone and Gravel Week ended May 30
Eastern	1,949	7,704
Allegheny	1,738	4,528
Pocahontas	369	1,315
Southern	799	9,144
Northwestern	888	6,761
Central Western	283	10,269
Southwestern	557	6,642
Total	6,583	46,363

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1930 AND 1931

District	Limestone Flux 1930 Period to date May 31	Limestone Flux 1931 Period to date May 30	Sand, Stone and Gravel 1930 Period to date May 31	Sand, Stone and Gravel 1931 Period to date May 30
Eastern	55,955	33,766	103,789	63,365
Allegheny	54,657	35,599	94,715	54,066
Pocahontas	7,857	5,213	19,606	16,572
Southern	14,516	13,946	154,480	147,270
Northwestern	17,179	11,910	61,298	49,836
Central Western	10,433	8,164	173,481	112,394
Southwestern	9,089	6,267	119,389	95,602
Total	169,686	114,865	726,758	539,105

COMPARATIVE TOTAL LOADINGS, 1930 AND 1931

	1930	1931
Limestone flux	*169,686*	*114,865*
Sand, stone, gravel	*726,758*	*539,105*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of June 27:

TRUNK LINE ASSOCIATION DOCKET

27268. **Sand and gravel,** in open-top equipment, carloads (See Note 2), from all Raritan River R. R. stations to Bethlehem, Penn., $1.50 per net ton. Present rate, $1.60. (See Note 4.)

27272. **Crude dolomite,** carloads (See Note 2), from Union Stone Co., Penn., and Chickies, Penn., to Bainbridge, Penn., inclusive, to Johnstown, Penn., $1.39 per gross ton. Present rate, $1.51. Reason—Proposed rate is comparable with rates on fluxing stone from Bellefonte and Naginey, Penn., to Pittsburgh and Johnstown, Penn.

27277. **Crushed stone,** carloads (See Note 2), from Le Roy, N. Y., to St. Marys, Penn., $1.40 per net ton. Present rate, $1.60. Reason—Proposed rate is comparable with rates from Kittanning Penn., to St. Marys, Penn.

27279. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Northeast, Bacon Hill, Charleston and Principio, Md., to Duncannon, Penn., $1.25 per net ton. Present rates, $1.60. (See Note 4.)

27280. **Slate, crushed, dust, ground, refuse and scrap,** carloads, minimum weight 50,000 lb., from Fairhaven, Vt., to Castleton, Vt., inclusive; Poultney, Vt., to West Pawlet, Vt., inclusive, to Point Pleasant, N. J., 22c per 100 lb. Present rate, 28½c, sixth class. Reason—Proposed rate is comparable with rate to Asbury Park and Spring Lake, N. Y.

27285. **Sand,** carloads (See Note 2), from Group 1 South Jersey-Vineland to Muskee Siding, Dorchester and Mays Landing, N. J., to Grasselli, N. J., $1.55 per net ton. Present rate, $1.96. (See Note 4.)

27306. **Slag, commercial, crushed,** in bulk in open-top equipment, carloads (See Note 2), from Scottdale, Penn., to

(a) Destinations in state of Pennsylvania located west of a line drawn from Cooks Mills, Penn., on the B. & O. R. R. to Cresson, Penn., on the P. R. R., thence due north to the Pennsylvania-New York State Line, in state of Ohio on and east of a line drawn from Toledo through North Baltimore, Arlington, Kenton, Delaware, Alton, Lancaster, Shawnee and Glouster to Belpre, O.

(b) Destinations in state of Maryland west of Hancock, Md., and state of West Virginia west of Hancock, W. Va.

Proposed rates:

(a) To destinations in Pennsylvania and Ohio, within limits defined, on basis of following mileage scale (rates in cents per 2000 lb.):

20 miles and under		60
40 miles and over	20	70
60 miles and over	40	80
80 miles and over	60	90
100 miles and over	80	100
125 miles and over	100	110
150 miles and over	125	120
175 miles and over	150	130
200 miles and over	175	140

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

(b) To destinations in Maryland and West Virginia, within limits defined, basis of the following mileage scale (rates in cents per 2000 lb.):

15 miles and under		60
25 miles and over	15	70
40 miles and over	25	80
60 miles and over	40	90
80 miles and over	60	100
100 miles and over	80	110
125 miles and over	100	120
150 miles and over	125	130
175 miles and over	150	140
200 miles and over	175	150
230 miles and over	200	160
290 miles and over	230	180
320 miles and over	290	190
350 miles and over	320	200

For joint hauls add 20c per 2000 lb. to single line scale rate, except to destinations on Monongahela R. R. and the B. R. & P. Ry. (See Note 4.)

27309. **Crushed stone,** carloads (See Note 2), from Le Roy, N. Y., to Avon, N. Y., 60c per net ton. Present rate, 65c. (See Note 4.)

M-1824. **Stone, crushed, quarry broken, or stone screenings,** carloads (See Note 2), from Jamesville, N. Y., to D. & H. Co. stations, Scranton to Mayfield, Penn., inclusive, $1.50 per net ton. Present rate, $1.75. (See Note 4.)

M-1826. **Sand and gravel,** other than blast, engine, foundry, glass, molding and silica, carloads (See Note 2), from Alfred, N. Y., to St. Marys, Penn., $1.20 per net ton. Present rate, $1.40. Reason—Proposed rate is comparable with rate from Kittanning, Penn.

27321. **Crushed stone,** carloads (See Note 2), from Durham, Penn., to Camden, N. J., $1.05 per net ton. Present rate, $1.15. (See Note 4.)

27323. (A) **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads, in shipping containers loaded on container cars.

(B) **Stone, natural** (other than bituminous asphalt rock), **dust,** carloads, in shipping containers loaded on container cars, minimum weight 110,000 lb., from South Bethlehem, N. Y.

To	Proposed rates (A)	(B)
Hillsdale, N. Y.	$0.90	$0.90
Towners, N. Y.	1.15	.....

Rates in cents per net ton.

Reason—Proposed rates are same as now in effect on crushed stone in regular equipment.

27325. **Gravel and sand,** other than blast, core, engine, fire, glass, grinding, molding, quartz, silex or silica (See Note 2), from Machias and Springville, N. Y., to Johnsonburg, Penn., $1.10 per net ton. Present rate, $1.25. (See Note 4.)

27332. To establish rates on **building, land, gas and glass lime,** from Chemical, Penn., to stations on the P. R. R., also to points within the state of Pennsylvania on connecting lines interchanged at these points on the same basis as now in effect from Bellefonte, Penn.

27335. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand) **and gravel,** carloads (See Note 2), from Humaston, N. Y., to Castleton, Schodack Landing, Stuyvesant, Newton Hook, Stockport, Hudson, Greendale, Linlithgo, Germantown, Tivoli, Tarrytown, Rhinecliff, Staatsburg, Hyde Park and Poughkeepsie, N. Y., $1.60 per net ton. Also establish rate of $1.60 per net ton on the above commodity from McConnellsville, N. Y., to Poughkeepsie, N. Y. Reason—Proposed rate is same as now in effect from Lacona, N. Y.

28336. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), from Stafford and Le Roy, N. Y., to Ebenezer, Springbrook, Elma, Jamison Road, Chaffee, Arcade, Delevan, Lime Lake, Machias, Franklinville, Humphrey and Ischua, N. Y., $1.10 per net ton. Reason—To eliminate Fourth Section departures.

27345. **Gravel and sand,** other than glass, core, engine, fire, grinding, molding, quartz, silex or silica, in carloads (See Note 2), from Machias and Springville, N. Y., to Crown, Penn., $1.20 per net ton. Present rate, $1.65. (See Note 4.)

27346. **Crushed stone and screenings,** carloads (See Note 2), from Blissville Docks, N. Y., to Islip, N. Y., $1 per net ton. Present rate, $1.25. Reason—Proposed rate compares favorably with rates on sand and gravel from Farmingdale, N. J., to Monorville and Southold, N. Y.

27350. **Crushed stone,** carloads, **slag, blast furnace, crushed,** in bulk, carloads (See Note 2), from East Buffalo, Buffalo (Louisiana St.), Buffalo Lake, Buffalo (East Ferry St.), Buffalo (Main St.), and Black Rock, N. Y., to Big Shanty, Penn., $1.10 per net ton. Present rate, $1.25. (See Note 4.)

27351. **Limestone, unburned, ground,** carloads, minimum weight 50,000 lb., from Natural Bridge, N. Y., to Norwich, N. Y., 13½c; Baldwinsville, N. Y., 10c; Cincinnatus, Binghamton, Johnson City, N. Y., 15c; and Scranton, Penn., and Horseheads, N. Y., 16c per 100 lb. Present rates, combination. (See Note 4.)

Sup. 2 to 26781, cancels Sup. 1. (A) **Building sand,** carloads, (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Hancock and Round Top, Md., to Ithaca and East Ithaca, N. Y. (A) $2.75 and (B) $3.10 per ton.

27361. **Stone, crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), from Casparis, Penn., to points in Pennsylvania (rates in cents per net ton):

To	Rate	To	Rate
Westland	142	Brandy Camp	215
Emporium	235	Merrittstown	119
Clarendon	225		

27365. **Sand and gravel,** in straight or mixed carloads (See Note 2), but not less than 60,000 lb., from Stamford, Ont., to La Salle, N. Y., 80c per net ton. Reason—Proposed rate is comparable with rates from Clarence, N. Y., to La Salle, N.Y.

27383. **Crushed stone** (limestone) in open-top equipment only, carloads (See Note 2), from Greer, W. Va., to points on the B. & O. R. R. east of Cumberland, Md., Hancock, Paw Paw, W. Va., North Branch, Md., Grace, Romney, Moorefield, Petersburg, W. Va., and various. Rates ranging from $1.20 to $1.50 per net ton. In all instances where rates are restricted to apply in open-top equipment only, the following provision will be published: "During period of car shortage when open-top equipment is not available and closed equipment is furnished, rates provided herein will apply." (See Note 4.)

27384. **Crushed stone,** carloads (See Note 2), from Martinsburg, Millville, Engle, W. Va., Security, Frederick and Grove, Md., to Green Spring, Grace, Romney, Glebe, Moorfield, Petersburg, W. Va., and various. Rates ranging from $1 to $1.40 per net ton. (See Note 4.)

27376. To establish the following rates on **sand** (blast, engine, fire, foundry, glass, molding or silica), from Slatington, Penn., to points in Pennsylvania (rates in cents per net ton):

To	Prop.	To	Prop.
Boyertown	180	Macungie	126
Emaus	126	Manheim	200
Kutztown	150	Quakertown	126
Lansdale	150	Reading	150
Linfield	160	Tamaqua	117

Reason—Proposed rates are fairly comparable with rates from Walnutport, Penn.

27386. **Crushed stone,** carloads (See Note 2), from Lime Crest, N. J., to Tunkhannock, Penn., $1.75 per net ton. Present rate, $1.95. (See Note 4.)

27389. **Agricultural, land, chemical, gas or glass lime,** carloads, minimum weight 30,000 lb., also **ground limestone,** carloads, minimum weight 50,000 lb., from Bellefonte, Pleasant Gap and Chemical, Penn., to Bordentown, N. J., to Burlington, N. J., 14½c per 100 lb. Reason—Proposed rates are comparable with rates from Martinsburg, W. Va.

27398. **Crushed stone,** carloads (See Note 2), from Lime Crest, N. J., to Water Gap, Penn., $1; Stroudsburg, Coolmoor, Penn., $1.10; Clifton, Penn., $1.20; Yatesville, Penn., $1.30, and Plains, Penn., $1.40 per net ton. (See Note 4.)

27399. To make the following changes in rates on **crushed stone,** carloads (See Note 2), from Havre-de-Grace, Md., to Highlandtown Jct. (Baltimore), Md., Highlandtown (Baltimore), Md., Sparrows Point Jct. (Baltimore), Md., Colgate Creek (Baltimore), Md., *Canton (Baltimore), Md., proposed rate, 80c. Reason—Proposed rate is comparable with rate to Camden Station and Locust Point. (Rates in cents per net ton.)

*For truck delivery only.

27404. **Limestone, ground, unburned,** carloads, minimum weight 50,000 lb., from Jordanville, N. Y., to points in New York (rates in cents per 100 lb.):

To	Prop.
Oxford	9
Norwood to Smyrna, inclusive	8½
Randallsville to Oriskany Falls, inclusive	8
Deansboro to Westmoreland, inclusive	7½
Bartlett	8
Eaton to Muns, inclusive	8½
Valley Mills to Sylvan Beach, inclusive	8
North Bay to West Monroe, inclusive	8½
Caughdenoy to Minetto, inclusive	9

(See Note 4.)

26858, Sup. 2. **Lime, agricultural, chemical and land,** carloads, minimum weight 30,000 lb., also unburned ground or pulverized limestone, carloads, minimum weight 50,000 lb., from Knickerbocker, Howellville, Rambo, Plymouth Meeting, Blue Bell, Devault, Swedsford Road, Bridgeport, Cedar Hollow, Cold Point, Exton, Mill Lane, Shainline, Swedeland and Williams, Penn., to Harrisburg, Penn., 9c per 100 lb.

27409. To establish from Hopatcong Junction, N. J., rates on **sand,** carloads, to points on the C. R. R. of N. J. and connecting lines west of High Bridge, N. J., same as now carried locally or jointly from Kenvil, N. J., C. R. R. of N. J. tracks.

27416. **Crushed stone and screenings and slag** (the product of iron and steel furnaces), **crushed,** in open-top equipment (See Note 2), from Buffalo, N. Y., to Clermont, Kinzua, Emporium and Struthers, Penn., $1.20 per net ton. (See Note 4.)

M-1837. **Stone, natural** (other than bituminous asphalt rock), **crushed,** N. O. I. B. N., carloads (See Note 2), from Bethlehem, Penn., to Kunkletown, Penn., 90c per net ton. Present rate, 1.25. Reason—Proposed rate is comparable with rate from Northampton, Penn., to Palmerton and Kunkletown, Penn.

Sup. 1 to 27185. (B) **Agricultural and land** lime, carloads, minimum weight 30,000 lb.; (D) **ground limestone,** carloads, minimum weight 50,000 lb., from:

Alba-Marl Lime Co., W. Va.	Martinsburg, W. Va.
Buckeystown, Md.	Millville, W. Va.
Capon Road, Va.	Natural Lime-Marl Co.'s Siding, W. Va.
Cedar Creek, Va.	Oranda, Va.
Charles Town, W.Va.	Security, Md.
Engle, W. Va.	Stephens City, Va.
Frederick, Md.	Strasburg, Va.
Grove, Md.	Strasburg Jct., Va.
Keller, Md.	Vaucluse, Va.
Annville, Penn.	Palmyra, Penn.
Brownstone, Penn.	Plymouth Meeting, Penn.
Cedar Hollow, Penn.	Paxtang, Penn.
Cold Point, Penn.	Shainline, Penn.
Donaghmore, Penn.	Swatara, Penn.
Howellsville, Penn.	Williams, Penn.
Hummelstown, Penn.	Winfield, Penn.
Mill Lane, Penn.	
Myerstown, Penn.	

To	Prop. rates (B)	(D)
Erie Jct. to Paynesville, N. Y.	16	16
Genessee to Shingle House, Penn.	16	....

Rates in cents per 100 lb.

CENTRAL FREIGHT ASSOCIATION DOCKET

28868. To establish on **sand and gravel,** carloads, from Fairviews and Swanville, Penn., to Vowinckel, Penn., rate of 140c per net ton. Present rate, sixth class.

28869. To amend agency and individual lines' tariffs publishing rates on **agricultural limestone,** carloads, from Gibsonburg, O., Sibley, Mich., and Woodville, O., to destinations in Michigan, by providing for carload minimum weight of 60,000 lb., in lieu of present carload minimum of 80,000 lb.

28880. To establish on **limestone,** carloads, minimum weight per Rule 15, page 25, to C. N. R. Tariff C. U. 120, from Fergus, Ont., to Port Huron, Mich., rate of 8c. Present rate, 22½c.

28895. To establish on **limestone, agricultural** (not ground or pulverized); **stone, crushed, and stone screenings,** in bulk, in open-top cars, in straight or mixed carloads, from Carey O. (Rates in cents per net ton.) To points in Pennsylvania.

B. & L. E. R.R.	Prop.		Prop.
Albion	170	Concord	180
Springboro	170	Cambridge Springs	170
Linesville	170	Meadville	170
Mercer	160	Sugar Creek	170
Grove City	170	Franklin	180
Harrisville	170	Greenville	160
Erie R.R.		Pulaski	160
Corry	180		

Present, class rates.

28897. To cancel the following rates on **stone, fluxing,** carloads (See Note 1), except when cars are loaded to cubical or visible capacity actual weights will apply, from Bellaire, O.

To	Rates	To	Rates
Bessemer, Penn.	139	New Castle, Penn.	139
Columbus, O.	189	S. Duquesne, Penn.	139
Munhall, Penn.	139	Zanesville, Penn.	151

As published in Item 105 of B. & O. R. R. Tariff 21570, account obsolete.

28921. To establish on **crushed stone** (in bulk); **screenings, crushed stone** (in bulk); **limestone, agricultural** (not ground or pulverized), in bulk in open-top cars only, and **screenings, agricultural limestone,** in carloads, from Holland, Mich., to N. Y. C. R. R. points in Ohio (in c. per net ton):

To	Prop.	Pres.	To	Prop.	Pres.
Lima City	60	65	Mortimer	85	90
Dunbridge	65	80	Findlay	85	90
Sugar Ridge	70	80	Arlington	90	100
Bowling Gr'n.	70	80	Williamstown	95	100
Portage	75	80	Dunkirk	95	100
Mermill	75	80	Landgraf	85	90
Galatea	80	90	New Reigel	85	90
Van Buren	85	90			

28925. To establish on **crushed stone,** carloads, from Findlay, O., to Defiance, O., rate of 60c per net ton. Route: Via B. & O. R. R. direct. Present rate, 70c.

28931. To establish on **sand** (all kinds), carloads, from Newark, O., to B. & O. R. R. stations. To points in Ohio:

To	Prop.	Pres.	To	Prop.	Pres.
Willard	100	110	Zanesville	65	70
Shelby	95	100	Sonora	75	80
Lexington	85	90	New Concord	80	90
Gatton Rock	80	90	Cambridge	85	90
Butler	80	90	Gibson	90	100
Fredericktown	75	80	Cochrane Mine	95	100
Mt. Vernon	65	70	Barnesville	100	110
Hunt	60	70	Bethesda	100	110
Summit	60	70	Camira	100	110
Taylor	65	70	Stewartsville	105	110
Chaltant	60	70	Senecaville	90	100
Somerset	65	70	Blue Bell	95	100
Carthon	70	80	Cumberland	100	110
Junction City	75	80	Fair Oaks	70	80
Pleasant Valley	60	70	Philo	75	80
			Eagleport	80	90
			Malta	85	90

28933. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, **glass, grinding** or polishing, loam, molding and silica) and **gravel,** carloads, from Kenneth and Lake Ciecott, Ind., to Haskell's, Ind., and on **agricultural limestone,** unburned, in open-top cars, **crushed stone,** in bulk, in open-top cars, and **stone screenings,** in bulk, in open-top cars, carloads, from Kenneth, Ind., to Haskell's, Ind., rate of 95c per net ton. Present rate, 105c.

28934. To establish on **crushed stone,** also **limestone, agricultural** (not ground or pulverized), in bulk, in open-top cars only), carloads (See Note 3), from Keeport, Ind., to following points in Indiana (rates in cents per net ton):

To	Prop.	To	Prop.
Hamilton	115	Wyatt	100
Ashley-Hudson	110	Lakeville	100
Helmer	110	Pine	100
Stroh	110	North Liberty	105
South Milford	110	Dillon	105
Wolcottville	105	Kingsbury	110
Eddy	105	Magee	110
Topeka	105	Westville	110
Stony Creek	105	Morris	115
Millersburg	105	Crocker	115
Benton	105	Willow Creek	120
New Paris	100	Gary	120
Foraker	100	Tolleston	120
Wakarusa	100		

28935. To establish on **crushed stone,** carloads, from Sandusky, O., to Mt. Vernon, O., rate of 80c per net ton. Route: Via B. & O. R. R. direct. Present rate, 90c.

28939. To cancel commodity rates on **sand and gravel,** from Washington C. H., O., to various destinations in Ohio, as published in P. R. R. Tariff Ohio F-1445, account obsolete.

28940. To establish on **sand and gravel,** carloads, in open-top equipment, from Massillon, O., to Kinsman, O., rate of 100c per net ton. Present rate, 140c.

28942. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) or **gravel,** in straight or mixed carloads, from Ashtabula, O., to Pittsburgh, Penn., rate of 120c per net ton. Present rate, 160c.

28951. To establish on **sand and gravel,** in bulk, in open-top cars, carloads, from Massillon, O., to Akron, O., rate of 60c per net ton, to expire with October 31, 1931, unless sooner canceled, changed or extended. Present rate, 70c.

ILLINOIS FREIGHT ASSOCIATION DOCKET

5388. **Limestone, ground or pulverized,** carloads, minimum weight 60,000 lb., from Valmeyer, Ill.

To	Rates per net ton Pres.	Prop.
Memphis, Tenn.	*	$2.10
New Orleans, La.	*	3.90

*Lowest combination.

6518-M. To cancel present rate of $2.14 on **chatts** (lead, ore, refuse), from East St. Louis, Ill., to Joliet and South Chicago, Ill., allowing the classification basis to apply in lieu thereof.

WESTERN TRUNK LINE DOCKET

1601-D. **Limestone, carloads** (See Note 2), but not less than 40,000 lb. per car, except that when cars of less marked capacity are furnished for the carrier's convenience the minimum will be the marked capacity of the car, from Inland Junction and Blaney Junction, Mich., to Bettendorf, Ia. Present rate, 26c per 100 lb. (Class "E"); proposed, 14c.

2079-P. **Stone, rubble** (rough, broken, irregular pieces, not machined or tooled), **and/or rip rap stone,** carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Lannon, Wis., to representative points:

	(A)	(B)	(C)
Baltimore, Md.	44.5	33.5	28.5
Boston, Mass.	49.5	38.5	31.5
New York, N. Y.	47.5	36.5	31.5
Philadelphia, Penn.	45.5	34.5	29.5

(Complete copy of exhibit furnished on request.)
(A) Present rate, sixth class.
(B) Proposed rate.
(C) Present rate westbound.

6146-K. Ordering and furnishing cars: **Sand, gravel, stone, crushed or ground, and limestone, agricultural,** carloads, between all points in Western Trunk Line territory. Proposed—To correct rules governing furnishing of cars of different size than ordered in so far as same applies to sand, gravel, crushed or ground stone and agricultural limestone, so that these rules will not apply when cars of less than 60,000 lb. capacity are ordered.

SOUTHERN FREIGHT ASSOCIATION DOCKET

55488. **Slate, crushed,** carloads, Fairmount, Bolivar and Whitestone, Ga., to York, Penn. Present rate, combination. Proposed rate on slate, crushed, carloads (See Note 3), from Fairmount, Bolivar and Whitestone, Ga., to York, Penn., 462c per 100 lb., same as currently in effect from Copperhill, Tenn.

55517. **Sand, gravel, crushed stone** (except bituminous rock or bituminous asphalt rock), **slag rubble stone, broken stone and chert,** carloads, Haile, Kendrick, Lary and Williston, Fla., to stations on the G. N. Ry. and G. A. S. & C. Ry. It is proposed to establish rates on the above-named commodities, from and to the above-named points on the basis of Docket 17517 joint-line scale, made in line with rates proposed under Submittal No. 54890.

55562. **Limestone,** carloads, (a) intraterritorially between points in Southern Freight Association territory; (b) interterritorially between points in S. F. A. territory on the one hand and points in Official Classification territory, including I. F. A. territory, on the other. At present class or combination rates apply. It is proposed to establish rates on limestone, honeycombed, natural, rough, as picked up from the earth, not quarried, carloads, minimum weight 50,000 lb., from and to the above named points on basis of 12th class rates.

55565. **Limestone, ground or pulverized,** carloads, Maymead and Shouns, Tenn., to Boone, N. C. Present rate, 240c per net ton (combination). Proposed rate, carloads, minimum weight 60,000 lb., except where marked capacity of car is less, in which event marked capacity of car will be the minimum weight, from Maymead and Shouns, Tenn., to Boone, N. C., $2 per net ton.

55246. Revision of rates on **limestone, ground or pulverized,** carloads, intraterritorially between points in Southern territory. Submittal No. 55246, included in Docket No. 577, assigned for hearing Tuesday, June 9, 1931, is hereby amended to make the suggested description read as follows: Limestone or marble (except bituminous rock, asphaltic limestone, bituminous asphalt rock, phosphate rock or gypsum), crushed, granulated, ground or pulverized, to fineness to pass through a screen of 5/16-in. mesh, including stone dust, in bulk or in bags, carload minimum weight 60,000 lb.

Stone, marble or granite (except bituminous rock, asphaltic limestone, bituminous asphalt rock, phosphate rock, soapstone or gypsum), crushed, granulated, ground or pulverized, including stone dust, in bulk or in bags, carload minimum weight 60,000 lb.

Limestone or marble chips (terrazzo aggregate), in bulk, or in bulk in bags or barrels, carloads, minimum weight 60,000 lb.

Slate, crushed, ground or pulverized, in bulk, or in bulk in bags, carload minimum weight 60,000 lb.

Slag granules (except ground basic slag), in bulk or in bulk in bags, carloads, minimum weight 60,000 lb.

SOUTHWESTERN FREIGHT BUREAU DOCKET

23133. **Stone, crushed, asphalt coated,** from Cape Girardeau, Mo., to Alpha, Mo. To provide rate of 120c per ton of 2000 lb. on stone, crushed, asphalt coated, carloads (See Note 1), except where car is loaded to full visible carrying capacity, actual weight will govern, from Cape Girardeau, Mo., to Alpha, Mo.; rate to expire 90 days from effective date. This rate is now in effect via Frisco Ry. one route, and it is desired to meet it via Missouri Pacific R. R.

23146. **Agricultural limestone,** from Valmeyer, Ill., to Missouri points. To establish the following rates in cents per ton of 2000 lb. on agricultural limestone, ground or pulverized, carloads, from Valmeyer, Ill., to points in Missouri shown below:

To	Miles	Rate	To	Miles	Rate
Webster Groves	36.8	*95	Crocker	173.2	170
Kirkwood	39.4	*95	Swedeborg	178.8	170
Windsor Springs	39.9	*95	Richland	186.4	170
Osage Hills	41.5	100	Stoutland	194.1	170
Valley Park	44.6	100	Sleeper	200.7	†170
Ranken	46.4	100	Carroll	202.5	†170
Tyson	48.6	100	Lebanon	208.4	†170
Mincke	49.7	100	Brush Cr'k	214	†170
Crescent	51.6	100	Huben	217.1	†170
Eureka	53.9	100	Phillipsb'g	220.5	†170
Allenton	56.5	100	Conway	225	†170
Bowes	60	100	Sampson	229.6	†170
Pacific	60.8	110	Niangua	233.5	†170
Prater	63.1	110	Marshfield	239.9	†170
Catawissa	65.5	110	Northview	246.5	†170
Robertsville	67.3	110	Holman	250.8	†170
Moselle Gravel	71.6	110	Strafford	254.3	†170
Moselle	72.7	110	Springfield	265.1	†170
St. Clair	78.9	110	Boyd	118	140
Anaconda	83.9	130	Halberts	119.2	140
Stanton	88.9	130	Sankey	121	140
Acid	91.2	130	Steelville	121.8	140
Sullivan	94.8	130	Roswell	124.8	140
Bourbon	101	140	Highway	127.8	140
Coffeyton	103.9	140	Keysville	129.6	140
Leasburg	106.3	140	Crooked Cr'k	132.7	140
Hofflins	110.4	140	Wesco	134.2	140
Cuba	113.5	140	Elma	136	140
Fanning	118.2	140	Hitch	137.3	140
Rosati	121.5	140	Cooks	137.6	140
St. James	127.1	140	Mackenzie	140.9	140
Dillon	132.3	140	Boscobel	142.5	140
Rolla	137.3	140	Bangert	143.8	140
Sills	139.5	140	Earls	145.7	140
Newburg	145.8	140	Howes	148.2	140
Orvis	149.1	140	Round House	152.5	160
Arlington	149.8	140	Salem	153.5	160
Jerome	150.4	160	Griffith	121.5	140
Franks	155.5	160	Craven	122.8	140
Wye	160.5	160	Elayer	124.8	140
Dixon	161.3	160	Cherry Valley	126.2	140
Rhodes	163.2	160	Faulkner	138.7	140
Helm	164.7	160	Sligo	141.7	140
Hancock	166.8	160	Pisgah	145.8	140
Purdon	168.7	160	School	148.2	140
			Winkler	149.8	140
			Austria	153.3	160
			De Camp	156.6	160

*Minimum rate. †Maximum rate.

Shippers have requested some basis better than the combination of locals in view of the rate of $1.70 per ton from St. Louis territory to Springfield, Mo. The proposed rates are based on the distance from Valmeyer, Ill., via Missouri Pacific through Ivory Transfer, to St. Louis, plus St. L.-S. F. Ry. distance beyond. The rates are the 9702 scale, subject to the St. Louis-Springfield, Mo., rate of $1.70 as maximum and 95c per ton as a minimum.

23151. **Building stone, etc.,** from Phenix, Mo., to Austin, Tex. To establish a rate of 31c per 100 lb. on stone, building, flagging and paving, not marble or granite, rough quarried, sawed or dressed; **artificial molded stone,** in straight or mixed carloads or in mixed carloads with crushed stone, minimum weight 50,000 lb., from Phenix, Mo., to Austin, Tex. The proposed rate is based 1½c over the rate from Carthage, Mo., to Austin, Tex., per Item 2030, S. W. L. Tariff 42T. This is the same differential as currently applicable to Ft. Worth, Tex., per Item 1960, and it is believed that the application of this differential to Austin is reasonable.

23178. **Crushed stone, etc.,** from Missouri points to East St. Louis, Ill. To establish a rate of 110c per ton of 2000 lb. on crushed stone (broken stone, ranging in size up to 200 lb. in weight), carloads, also riprap (irregular shaped rock), in pieces ranging up to 200 lb. weight, carloads (See Note 3), from Pilot Knob, Bushburg, Glen Park, Horine, Iron Mountain, Kimmswick, Lopez, Middlebrook and Silica to East St. Louis, Ill. (applies only to deliveries on the A. & S. or T. R. R. A.). Shipper states that the present rate of 140c per ton from Pilot Knob is not satisfactory, and that the description (chatt) in Items 445 and 450 is not exactly the same as the kind of stone which it is desired to ship. The proposed rate is substantially higher than the 17000 part 11 scale and is the same as the 9702 scale from Pilot Knob. The rates to St. Louis range from 95c downward. It is, therefore, felt the proposed rate is proper, especially when compared with rate of 122c to Edwardsville, Ill., in Item 90C of Missouri Pacific Tariff No. 3053H.

23182. **Asphalt rock, etc.,** from Texas points to Illinois points. To establish a rate of 25c per 100 lb. on asphalt rock, stone, natural or coated with not to exceed 5% of road oil, crushed or ground, straight or mixed carloads (See Note 1), but not less than 50,000 lb., from Blewett, Cline, Dabney, La Pryor, Pulliam, Uvalde and Whitesmine, Tex., to Belleville and Collinsville, Ill.

The 25c rate to St. Louis in Item 1410 is subject to Rule 27 and therefore applies at Belleville via certain routes. The same rate is proposed via other routes. Belleville and Collinsville are ordinarily grouped at the St. Louis territory basis of rates, and this proposal would extend the St. Louis, Mo., rates to adjacent points in St. Louis territory. The St. Louis rate of 14c from the Bowling Green, Ky., district is also applicable to Belleville and Collinsville, Ill. It is therefore felt proper to extend the St. Louis, Mo., rates to Belleville and Collinsville from Texas, that the Texas shippers might be better able to compete with the Kentucky shippers.

23190. **Crushed stone, etc.,** from Des Moines, Ia., to points in Missouri. To establish the following rates in cents per ton of 2000 lb. on crushed stone, coated with oil, tar or asphaltum, carloads (See Note 3), but not less than 40,000 lb., from Des Moines, Ia., to points in Missouri.

Note—The following rates apply for single line application only. For joint line application the following rates plus 25c per ton of 2000 lb. will apply (rates in cents per ton of 2000 lb.):

Distances	Rates	Distances	Rates
10 miles or less	96	175 to 200 miles	199
10 to 25 miles	96	200 to 225 miles	211
25 to 40 miles	107	225 to 250 miles	222
40 to 60 miles	119	250 to 275 miles	234
60 to 75 miles	130	275 to 300 miles	257
75 to 100 miles	142	300 to 325 miles	268
100 to 125 miles	153	325 to 350 miles	280
125 to 150 miles	176	350 to 375 miles	291
150 to 175 miles	188	375 to 400 miles	303

Proponent feels that the present distance scale in effect from Des Moines, Ia., to Missouri, Minnesota and South Dakota, for single line application should be extended to apply on traffic to destinations within a radius of 400 miles of Des Moines, Ia., located in Illinois, Nebraska, Kansas and North Dakota, and that for joint line application to all of the territory involved by this proposal, rates based 30c per net ton over the single line scale. It is the desire of this firm to expand their business, but under the present rate situation they are assessed either a combination or through Class "D" rate, either basis of which, it is stated, makes a movement from their plant prohibitive.

23196. **Silica sand,** from Rogers, Ark., to Sweetwater, Tex. To establish a rate of 360c per ton of 2000 lb. on silica sand, carloads (See Note 2), from Rogers, Ark., to Sweetwater, Tex. Shippers of silica sand at Rogers, Ark., desire to be on a competitive basis with those at Guion, Ark., from which point a rate based 9½% of the Column 100 rate prescribed in I. C. C. Docket 13535 was recently approved. The rate here proposed is on the same basis, using mileage of 575.7 miles figured from S. W. L. Mileage Table 4-A and Texas Lines' Mileage Table 1-F.

23203. **Asphalt rock,** from Dougherty, Okla., to Stop 38, Okla. To establish a rate of 12c per 100 lb. on asphalt rock, carloads (See Note 1), from Dougherty, Okla., to Stop 38, Okla. On shipments routed Santa Fe, Jennings, Okla., Frisco, Claremore, Okla., Missouri Pacific, Nowata, Okla., and Union Traction Co., the rate is 12c per 100 lb., based 9c (S. W. L. Tariff 55L) to Nowata, 3c beyond (S. W. L. Tariff 55L). The short line distance is 242.7 miles; the scale in S. W. F. B. Docket 18957 for that distance and as well the examiner's report in I. C. C. Docket 23094 is $2.20 per ton or 20c per ton less than proposed herein; and substantially lower than proposed is applicable within Texas for the involved distance. The present rate to Coffeyville is 10½c per 100 lb. and the destination is only 22 miles therefrom.

23204. **Asphalt rock,** from Bratcher, Okla., to points in Louisiana, also Vicksburg, Miss. To establish same rates on asphalt rock as are now in effect from Dougherty, Okla., by adding Bratcher, Okla., as a point of origin along with Dougherty in Item 2216B, Supplement 92, S. W. L. Tariff 59M. Bratcher, Okla., is only 5.7 miles west of Ardmore and is on the line of the former O. N. M. & P. Ry. Dougherty is 20 miles north of Ardmore. There is a deposit at Bratcher and shippers urge that they are entitled to the Dougherty rates and are deprived of making competitive bids by the prohibitive class rates now effective.

23209. **Limestone, agricultural** (for land fertilization only), from Algoa Farms, Mo., to points in Missouri. To add Algoa Farms, Mo., a local point on the Missouri Pacific R. R., as a point of origin in Item 1105-G of W. T. L. Tariff 91-F. A plant has recently been established at Algoa Farms, Mo., which point is located just east of Jefferson City, Mo., on the Missouri Pacific R. R., and is now in readiness to make carload shipments. It is desired to have rates established from this point to the same extent as are now applicable from specific points shown in Item 1105-E. The mileage scale of rates contained in Item 1105-E are maintained under authority of and in compliance with Public Service Commission of Missouri Case No. 3421. In that decision it was stated that the rates need not be published for general application throughout the state, but should be published specifically from known points of production.

I. C. C. Decisions

23157. **Sand and Gravel.** The Interstate Commerce Commission in a report written by Commissioner Aitchison, in Smoot Sand and Gravel Corp. vs. B. & O. et al., has found unreasonable the rates on sand and gravel, from Georgetown, D. C., the railroad station name of the western part of the national capitol, to destinations in Maryland, Pennsylvania and the Virginias, to the extent they may exceed rates made in accordance with a scale for distances not in excess of 350 miles. New rates are to be established not later than September 14.

The area to which the new rates are to apply consist, roughly, of that part of Maryland lying north and west of Washington and Baltimore, Md., the south central part of Pennsylvania lying south of a line from Hanover, Penn., through Gettysburg, Carlisle Junction, Shippensburg, Dunnings Creek Junction and Rockwood, Penn., to Connellsville, Penn., the north central parts of West Virginia and Virginia east and north of a line running south from Connellsville through Morgantown to Elkins, W. Va., thence north through Pierce, W. Va., to Cumberland, Md., thence south to Petersburg, W. Va., and thence east to Strasburg, Va., and Washington.

The scale to be used in making rates begins with a rate of 60c a net ton for 15 miles and under; becomes 90c for the block between 40 and 60 miles; 110c between 80 and 100 miles; 150c between 175 and 200 miles; 190c between 290 and 320 miles, and 200c between 320 and 350 miles. Twenty cents a ton are to be added for movements over two or more lines. A further arbitrary of 20c a ton is to be added for movements over the Chesapeake Beach railway. That arbitrary is to accrue to that carrier solely.

A further finding is that the rates assailed on gravel from Georgetown to points on the Baltimore and Ohio east of and including Cumberland are and for the future will be unduly prejudicial to Georgetown and complainant, and unduly preferential of Martinsburg, Security and Stephens City, Md., and producers of crushed stone located at those points, to the extent that their relationship to the interstate rates on crushed stone from the three preferred points named to the same destinations are less favorable to the complainant than would result from the uniform application on the respective commodities from all the points of origin to

the same destinations of the scale of rates prescribed for application from Georgetown.

Distances are to be computed over the shortest routes by existing connections for the interchange of carload traffic but not using the lines of more than three line-haul carriers.

21939. Road Materials. Examiner Burton Fuller, on further hearing, sand, gravel, and crushed stone from Indiana and Illinois points to destinations in Illinois, has recommended modification in part of the findings in the original report, 160 I. C. C. 507, as to rates to destinations in Illinois on and south of the Terre Haute-St. Louis line of the Pennsylvania railroad on sand, gravel, and crushed stone, from points in Indiana and Illinois; on crushed stone, from Marquette and Cape Girardeau, Mo., and on chatt, from producing points in Missouri.

Hundreds of rates, set forth in two appendices, C and D, not herein reproduced, are recommended for prescription by the Commission for interstate and intrastate application.

This report also embraces I. and S. No. 3093, sand, gravel and crushed stone, from Indiana points to destinations in Illinois; No. 21372, Ohio & Indiana Stone Co. et al. vs. C. C. C. & St. L. et al.; No. 23707, Dickason Sand and Gravel Co. vs. B. & O. et al., and No. 24298, Montezuma Gravel Co. vs. B. & O. et al. The cases other than the Montezuma Gravel Co. case were heard co-operatively with the Illinois commission Dockets No. 17841, H. H. Halliday Sand Co. et al. vs. B. & O. et al.; No. 17863, Anna Stone Co. vs. B. & O. et al.; No. 20554, Columbia Quarry Co. vs. Alton & Southern et al.; and No. 20618, Illinois Electric Limestone Co. vs. B. & O. et al. The Montezuma Gravel Co. case was heard jointly with the Indiana commission Docket No. 10431, Montezuma Gravel Co. vs. B. & O. et al.

The proposed report said the rate structure recommended would result in a fair relationship between producing points, was properly aligned with rates established or prescribed in other cases to destinations in the same general territory, and would yield earnings which would be fair to the carriers, giving due consideration to distance and other transportation conditions and the group and differential nature of the adjustment. Manifestly, said the report, the proposed structure should be tested with regard to all of these factors and not solely with regard to distance or any other single factor.

The report said the Commission should find the rates set forth in Appendix C were reasonable and nonprejudicial *inter se* on interstate traffic; the interstate rates in which changes were recommended were unreasonable to the extent that they exceeded and were unduly prejudicial as between shippers in interstate traffic to the extent that they differed from those set forth in Appendix C; that the interstate and intrastate rates set forth in that appendix were nonprejudicial and nondiscriminatory as between interstate shippers on the one hand and intrastate shippers on the other. The report said the findings in the original report, 160 I. C. C. 507, should be modified accordingly.

The Commission should further find, said the report, that the rates from Cayuga and Montezuma, Ind., for joint hauls in connection with the Chicago and Eastern Illinois were and for the future would be unreasonable to the extent that they exceeded those set forth as prescribed in Appendix D, and that the prescribed rates would remove the alleged undue prejudice against complainants in No. 23707 and 24298. "These findings," said the report, "apply in so far as commodity rates are in effect or are recommended and are subject to the following provisions: (1) rates to local destinations shall be the same as to the first key destination next beyond, and (2) the rates prescribed shall be subject to a minimum of 90% of the marked capacity of the car except when car is loaded to full visible capacity actual weight will apply. They are made without prejudice to the right of any party to seek additional commodity rates to this destination territory in line with the adjustment approved or prescribed herein."

Some of the rates carried in the appendices are in effect by reason of the action by either of the Indiana or the Illinois commission and of the interested carriers. For instance, the report says the rates prescribed from Anna, Cairo and Metropolis, Ill., were established on March 31, 1930, and were the present rates. The report said that that was likewise true of the rates from Missouri except in connection with the Burlington. The other rates to southern Illinois prescribed or approved by the state commissions were established on March 31, 1930, said the report, and had been since voluntarily maintained by the carriers, except the rates from Indiana and Illinois in connection with the Chicago and Eastern Illinois and the Baltimore and Ohio, the interstate rates in connection with the Burlington, and certain of the intrastate rates from the East St. Louis district.

These facts with regard to the present situation caused the use of the language in the report showing that some of the rates in the recommended appendices had already been prescribed.

Many Roads Seek Rate Reductions

CONTRASTING with the effort of the railroads to obtain a 15% horizontal increase in freight rates to stabilize their credit and provide for an efficient and adequate transportation service, applications are still being received by the Interstate Commerce Commission from various roads seeking reductions to meet motor truck competition.

At the commission's sixth section board it was said recently that applications for special permission to make reduced rates on a wide range of commodities, effective on less than thirty days' notice, required under the statute, are received almost daily.

These applications cover such commodities as automobiles, sand and gravel, petroleum and petroleum products, canned goods, lumber, cotton and brick.—*Chicago* (Ill.) *Journal of Commerce.*

Make Special Limestone Rates for Wisconsin County

WORD HAS BEEN RECEIVED that the Omaha railway will cooperate with the South Shore line in delivering carbide lime at a reasonable freight charge to all points along their line in Bayfield county, Wisconsin.

Cars will be switched at either Bibon or Iron River to all points along the Omaha for an additional freight charge of approximately 22% per ton. These rates make it possible to deliver the lime carbide for approximately $1.20 per ton to all points of the South Shore line and $1.40 per ton to all points along the Omaha line within the county. This offer holds good until September 30, 1931.—*Ashland* (Wis.) *Press.*

Cement Companies Attack Railroad Charges

THREE CALIFORNIA CEMENT COMPANIES are involved in controversy with the railroads serving their plants, and each concern has petitioned the state railroad commission to interfere, it was recently disclosed in announcements by the commission.

The California Portland Cement Co. at Colton attacks the Southern Pacific, Pacific Electric, Santa Fe and Union Pacific railroads, alleging excessive freight rates have been levied for transportation of petroleum by-products from Los Angeles county refineries to the Colton plant. Reparation on the basis of lower rates to be determined by the commission, is asked of the railroads, in the petition of the Colton firm.

The Southwestern Portland Cement Co. of Victorville is appealing to the railroad commission for relief from asserted discrimination in charges for transporting of cement from its plant in Cajon pass, as compared with rates levied for hauling of the product of the California Portland Cement Co. and the Riverside Cement Co. of Oro Grande and Crestmore.—*San Bernardino* (Calif.) *Telegram.*

Nebraska Gravel Rate Hearing Date Advanced

HEARING in the sand and gravel rate controversy affecting all Nebraska carriers has been continued until July 7.

Misunderstanding of some of the roads on date of the hearing was said to be the cause of the continuance.

All phases of the gravel rate structure will be aired at the next sitting of the state railway commission in July. In calling the new hearing, the third, the rail commission says that "indiscriminatory" rates will be determined.

Regardless of the future hearing, the June 4 order of the rail commission, reducing the tariff on sand and gravel at a number of points earlier applied for by some of the roads, will stand.—*Kearney* (Neb.) *Hub.*

I. C. C. Alabama Fertilizer Ruling Stands

THE STATE of Alabama recently lost its suit to restrain the Interstate Commerce Commission from enforcing an order fixing the minimum rates for the intrastate transportation in Alabama of fertilizer and fertilizer materials.—*Boston* (Mass.) *News Bureau.*

Materials Engineers Discuss Quality, Specifications, and Tests

Annual Meeting of American Society for Testing Materials Held at Chicago, June 23-26

OWING PERHAPS to the exceptionally torrid weather, the sessions of the American Society for Testing Materials relating to the various rock products were not as lively and interesting as they usually are. The most interesting discussions of all were those on masonry mortar materials, and the most interesting of these was a "rump" session not held under the auspices of the American Society for Testing Materials but called by the officials of the American Face Brick Association to solicit financial support from masonry cement, lime, sand-lime brick, common brick, terra cotta and other industries, to continue the research work at the Bureau of Standards, under L. A. Palmer, which was recently referred to in the report of the National Lime Association convention in Rock Products, June 20, pages 56-63.

It is understood that the American Face Brick Association was successful in interesting the other industries in its research program and that it will be continued.

Our convention report is divided into the following sections: (1) General, (2) Cement, (3) Aggregates, (4) Admixtures, (5) Ready Mixed Concrete, (6) Concrete Products, (7) Concrete, (8) Lime, (9) Gypsum and (10) Slate, Stone and miscellaneous rock products items.

(1) General

In a paper on "Economic Aspects of Masonry from Weathering Effects," H. S. Brightly, Building Stone Association of Indiana, stressed the tremendous economic loss that results annually through failure to use properly and specify materials according to the best known practice. This statement applies to all masonry materials and its importance deserves the most serious consideration. He pointed out that different atmospheric conditions result in varied performance from the same material in different localities. This must be taken into consideration in seeking the economic materials of construction for individual jobs. It is important to realize that durability of materials is dependent on their proper application as well as that they have adequate physical characteristics. Some of the factors that influence the durability of these materials are moisture content, influence of temperature change, influence of frost action, efflorescence, and chemical weathering. Because of the limited time it was necessary for Mr. Brightly to give a very hurried abstract of much of his paper. In closing he emphasized the fact that it is many times cheaper to take care of weathering when building than to repair those parts which fail after their weaknesses have been brought out in service. Moisture penetration was said to be the major factor in disintegration.

In the discussion of freezing and thawing tests in the session on "Weathering Characteristics of Masonry Materials" it was brought out that consideration should be given the method of freezing, particular attention being directed to the experience in the quick freezing of meats. In this work it was found that small crystals formed with quick freezing were much less harmful to the meat cells than large crystals that formed with slower freezing. It was also brought out that in the sodium sulfate test of concrete there is a chemical action between the sodium sulfate and the cement, so that it does not represent the exact conditions experienced in actual freezing and thawing.

In a paper, "The Permanence of Concrete in Exposed Structures," Ephrem Viens, Department of Public Works, Canada, stated that we know that the agents contributing to the destruction of building materials are wind, water, temperature changes, crystallization of salts and chemical reactions. These agents acting individually and collectively will, in time, destroy the best of materials. To resist most successfully nature's agents of destruction, an ideal material should be homogeneous and impervious, it was stated by Mr. Viens.

Based on samples from each of 21 quarries representing four types of Wisconsin limestones, weathering tests consisting of 80 or more reversals of freezing and thawing of continually immersed samples occasioned relative disintegration comparable with what might have been expected from field inspection, according to L. O. Hanson, University of Wisconsin, in his paper on the "Weathering of Aggregates."

Accelerated weathering tests of five cycles —each cycle consisting essentially of immersion in concentrated sodium sulfate solution at 122 deg. F. followed by immersion in concentrated sodium sulfate solution at 70 deg. F. followed by drying at 212 deg. F.— caused disintegration roughly comparable to that obtained by alternate freezing and thawing of the above limestones.

(2) Cement

The report of the Committee C-1 on Cement stated that the committee had completed its reorganization and had obtained the permission of the society to employ an all-time specialist to study and keep the committee informed of the attitude of those interested in cement toward the society's specifications and methods of tests covering cement. It was informally announced that J. R. Dwyer of the United States Bureau of Standards, who has been in charge of the cement reference laboratory in Washington, would be this technical employe and his work would start on July 1.

Committee C-1 on Cement is now spending $15,000 to $18,000 a year on the reference laboratory, on research work, and for its technical assistant, and is the first subdivision of the society to have such an employe.

The tentative specification adopted by the society for high-early-strength portland cement were voted to be continued, and another sub-committee of the society is doing its best to develop a modern specification for masonry cement, the one on the books of the society being some 20-odd years old.

Nothing very much new came out in the discussions on cement except that it was pointed out that a more definite specification for high-early-strength cement was desirable.

The desirability or necessity of some present specifications which limit the temperature of the cement received at the job was questioned, as also was the signifiance of the temperature of the concrete during setting.

Temperatures in Concrete

R. E. Davis and G. E. Troxwell, of the University of California, in their paper, "Temperatures Developed in Mass Concrete and Their Effect Upon the Compressive Strength," stated, regarding the cement: "Heat in considerable quantities is generated by all normal portland cements by hydration. . . . Other things being equal, the magnitude of the temperature rise as well as the shape of the time-temperature curve is substantially influenced by the kind or quality of the cement. . . . For normal mixes and normal portland cements, the maximum temperature may be reached in small specimens within less than 24 hr. after casting. But in large mass, the heat of delayed hydration may be generated sufficiently slowly to in-

crease the temperature for several weeks, and in comparing cements the rise in temperature during the early stages of the hardening process is no safe criterion to the temperature which may ultimately be reached. . . . Variations in compressive strength as influenced by the kind or quality of cement are greater for mass-cured than for normal-cured concretes. Furthermore, at least for the early ages, the strength ratio of two cements in normal-cured concrete is no indication of the corresponding strength ratio in mass-cured concretes. Thus at a given age brand 'A' may exhibit a substantially higher strength than brand 'B' in concrete cured at 70 deg. F., as, say, in a paving slab, but the reverse may be true in the concrete of a dam or other structure of large proportions where the heat of hydration increases the temperature considerably above normal."

Determining Cement Content of Concrete

Two discussions of the report of Committee C-9 on Concrete and Concrete Aggregates dealt with the determination of the cement content of concrete which doubtless will prove interesting to many cement plant chemists, as this is sometimes necessary laboratory routine.

W. M. Dunagan, Iowa State College, in his paper, "A Study of the Analysis of Fresh Concrete," described in detail the laboratory procedure in determining the specific gravity of the aggregates upon which his method of cement determination is based. His paper included the results of a number of tests.

The purposes of his tests are to facilitate the enforcing of specifications in the following direction:

"(a) Determination of the segregation occurring in mixing and placing in order to establish uniformity.

"(b) To determine the efficiency of various mixers or conveyances for concrete.

"(c) To determine the water-cement ratio of a batch from a quick analysis of the mortar screened from a sample.

"(d) Where proportioning has been accomplished by volume, analyses of samples will verify the accuracy of bulking factor corrections particularly through the ability of the test to determine cement-fine aggregate relations."

H. F. Kriege, France Stone Co., in a paper, "Determining the Cement Content of Set Concrete by Chemical Methods of Analysis," described a process very similar to the one by J. L. Heitzmann in Rock Products, November 8, 1930, page 62, but with additional refinements.

Differences in Cement

It is known that different brands of cement offer different resistances to the action of alkaline solutions, according to Ephrem Viens, of the Canadian Public Works Department, who asked: "Does it follow that different brands also have different durability factors when exposed to normal weathering conditions and if so, how important are these differences? Unfortunately, tests performed to determine the relative resistances of various brands of cement to deteriorating agents other than to alkaline solutions have not advanced as far as those on alkaline solutions alone."

(3) Aggregates

The report of Committee C-9 on Concrete Aggregates included a proposed tentative method of test for the structural strength of fine aggregate, using a constant water-cement ratio mortar and a proposed tentative method of test for the apparent specific gravity of coarse aggregates in a saturated condition.

Methods of determining the specific gravity of concrete aggregates have already been referred to under the paragraphs on Cement in the paper, "A Study of the Analysis of Fresh Concrete," by W. M. Dunagan.

Differences in Types of Aggregates and Their Effect

P. M. Noble, Kansas State Agricultural College, read a paper, "The Effect of Aggregate and Other Variables on the Elastic Properties of Concrete," which described in detail tests with local sand and gravel and crushed stone aggregates in which it was concluded (in part):

"There is a very pronounced difference in the shape of the curves for different types of aggregate. The curves for the hard flinty aggregates are much steeper than for the softer aggregates. The very marked effect of variations in aggregate upon the value of the modulus of elasticity is particularly significant, the extent of this variation being such that it should by all means enter into the design of reinforced concrete structures.

"For sand-gravel concrete there is a decided tendency of the value of E to increase in the fineness modulus. There is no definite relation between the fineness modulus and Poisson's ratio within the limits of these tests.

"A maximum value of E for sand-gravel concrete was obtained for mixes of 1:3½ to 1:4 with lower values for the richer and leaner mixes. However, the richer mixes show a greater increase with age.

"Variation in the richness of mix has no pronounced effect on the value of Poisson's ratio.

"Maximum values of the modulus of elasticity occur for a water-cement ratio of 0.7. [This factor expresses the ratio by volume of the water to the cement.—Editor.]

"There is no definite relation between the modulus of elasticity and the 28-day strength for concrete made of various types of aggregate. For a given aggregate an increase in the ultimate strength is accompanied by an increase in the modulus of elasticity."

Freezing and Thawing Tests of Aggregates

F. C. Lang and C. A. Hughes, University of Minnesota, presented a paper on "Accelerated Freezing and Thawing as a Quality Test for Concrete Aggregates," which aroused very much interest among testing engineers in the audience, as it reduces to a matter of hours tests that formerly required days for their completion, and apparently gives a very good clue as to the soundness of various aggregates. The principal tests were made on local Minnesota sand and gravel and limestone and were rather much to the advantage of the local gravel.

The purpose of the investigation was to develop a definite test for the quality of gravel pebbles for use in exposed concrete that would eliminate the personal equation which is so large a factor in all the methods of testing aggregates now available. For this purpose an accelerated freezing and thawing test consisting of 5 min. in hot water, 5 min. in ice water, and 30 min. directly submerged in calcium chloride brine at 0 deg. F. was used.

The accelerated tests (10 cycles per day) were made on gravel pebbles from 18 different sources, two sedimentary rocks and nine deleterious materials. Similar data were acquired for concretes made with 17 of the aggregates tested.

The authors concluded: "While further research is required, there appears to be a distinct possibility of developing an accelerated freezing-and-thawing test which will provide a more reliable and definite measure of the quality of gravel aggregates than methods of testing now in use.

"The grading of the aggregate specimen and the type of cycle, particularly in regard to rapidity of cooling and duration of freezing period, have an important effect on the disintegration resulting from freezing and thawing.

"To be assured of properly rating fine-grained sedimentary rocks such as limestone and slate, it is necessary to use more than 10 cycles or longer freezing periods than 30 min. The rating of the other materials tested was much less affected by the number of cycles and the duration of the freezing period.

"Data obtained on gravel pebbles by a slow cycle (24 hr.) of freezing and thawing in water correlated closely with that obtained by an accelerated cycle (40 min.) consisting of 5 min. in hot water, 5 min. in ice water, and 30 min. freezing directly immersed in brine solution.

"A relationship exists between the durability of coarse aggregates and the durability of concretes made therefrom.

"The cement paste of concrete specimens used in freezing and thawing tests intended to reveal the durability of the aggregate should be of such quality at time of test that disintegration will depend more on aggregate quality than paste quality.

"From the data presented it would appear that 10% passing the No. 8 sieve after 30 cycles of the accelerated test is the limit for aggregates suitable for use in concrete for exposed situations."

Effects of Grading of Aggregate

According to Ephrem Viens, Canadian Department of Public Works, recent tests would indicate that the grading of the coarse aggregate within standard specification limits is not an important factor in determining the strength of concrete. The grading will, however, affect the workability of the mix and the most important consideration is to avoid an excess of material in the real mix between the ⅜-in. and No. 8 sieves.

In the choice of maximum size of aggregate, factors to be considered are the nature of the work, the increase in cost of placing with increasing size of aggregate, the increase in cement necessary to maintain a given consistency with constant water-cement ratio as the maximum size is decreased, and the variation in cost of crushing and screening.

In preparing coarse aggregate, provision should be made to separate it into a sufficient number of sizes to insure a constant grading when mixing takes place.

In selecting a fine aggregate, the grading is important in determining the workability and there should not be an excess of material retained on any one sieve. A simple rule is that not more than about 60% should be retained on any two successive sieves. To produce water-tight concrete there should be from 10 to 20% passing the No. 50 sieve.

Fineness moduli, based on mechanical analyses before and after weathering tests, are a fairly satisfactory measure for limestones of the disintegration caused by weathering tests, provided the original sample is composed of fragments which are not of widely different sizes, according to L. O. Hanson, of Wisconsin University.

Weathering Tests of Aggregates

No relationship was found to exist between the weathering characteristics and the absorptive properties of the limestones tested by Mr. Hanson. Based on tests of 18 mortar mixes representing four sands, an accelerated weathering test of five cycles caused a weakening of the specimens inversely proportional to their 28-day strengths.

F. H. Jackson, U. S. Bureau of Public Roads, in the "Symposium on the Weathering of Masonry Materials," said that in tests by various men, it is significant to note that in all cases the results which have been secured indicate, in general, that the strength of the mortar or concrete, as measured by the water-cement ratio used in the mix, is a more important factor in controlling the resistance to freezing and thawing of concrete than is the character of the aggregate employed, especially in the richer mixes. This is of course only true within certain broad limits, as it is well known that aggregates containing large quantities of obviously unsound materials, such as shale, etc., will produce unsound concrete regardless of the water-cement ratio used.

According to D. W. Kessler, U. S. Bureau of Standards, a recent test on a limestone that endured for several centuries in France showed that the material could be completely disintegrated by 18 freezing and thawing cycles when the specimens were frozen while partly immersed in water.

Pavement Tests Give Data on Aggregates

F. H. Jackson and W. F. Kellermann, of the United States Bureau of Public Roads, described a series of tests on a 9-ft. concrete pavement approximately one-half mile long, constructed for the purpose of studying the effect of increasing the amount of coarse aggregate considerably beyond the quantity generally used, and presented data on such questions as effect of variations in water-cement ratio on strength of the concrete in structure, relation between consistency and extent of honeycomb, and effect of method of finishing on both strength and homogeneity.

This paper was chiefly interesting to aggregate producers in showing that there was an amount of honeycombing in the gravel concretes in which there was more than the ordinary amount of ⅜ in. down material, and the amount of this honeycombing more than compensated the favorable factors. The same amount of honeycombing did not occur in the crushed stone aggregate, and Mr. Jackson did not attempt at this time to explain its cause other than that it might be due to void size in the small size gravel, which prevented the cement mortar from penetrating to the base of the pavement.

(4) Admixtures

But one paper at the convention was specifically devoted to concrete admixtures, and that was by Frank R. Wicks, Pacific Coast Talc Co., on "Crystalline Talc as an Admixture in Concrete." The principal point emphasized by this paper was that crystalline talc was different from other admixtures in that it did not require any additional water in the mix, thus not increasing the water-cement ratio which tends to decrease strength at the expense of workability.

The paper was discussed by George A. Smith, Johns-Manville Corp., producers of "Celite," who rather discounted the results.

(5) Ready-Mixed Concrete

Willis A. Slater, Lehigh University, read a paper, "Tests of Concrete Conveyed from a Central Mixing Plant," which recorded results of tests made to determine the effect on the properties of concrete, of transporting it for 2½ hr. in a truck whose container consisted of a closed rotating drum without mixing blades. Samples were taken at ½-hr. intervals on which were made tests of slump and composition of the concrete. Compressive strength specimens were also made for tests at different ages.

Within the limits detected by the measurement, the concrete retained the water and all its cement throughout the 2½-hr. transporting period. There was considerable decrease in slump and evidence of pulverizing of a considerable quantity of aggregate. The stiffening which occurred within the first hour, he concluded, would improve the consistency of the concrete for almost any purpose. Even after 2½ hr. in the drum, the consistency would be quite satisfactory for road and pavement work where the requirements are quite rigid. There was no evidence of segregation during the period of transporting.

The strength of the concrete from samples taken at successive intervals after charging the conveyor drum increased progressively according to the length of time during which the samples had been transported in the conveyor. The average 28-day strength of specimens taken after 2½ hr. of transporting was about 900 lb. per sq. in. higher than that taken from the mixer.

The results of Prof. Slater's study are given as follows:

"The slump was generally about 8 in. as the concrete came from the mixer, but decreased very consistently during the time of retention in the conveyor drum.

"The amount of water and the sum of the absolute volumes of the cement and aggregates remained practically constant throughout each run. The amount of cement, however, appeared to increase. As this apparent increase was about the same as the decrease in the absolute volume of the sand, it is likely that it was due to the pulverizing of the aggregates, especially the sand.

"The apparent increase in cement content in a batch of concrete mixed in a Jaeger mixer for 1 hr. 15 min. was much greater than that in the drum of the conveyor and the stiffening of the batch was correspondingly more marked.

"There was no indication of segregation of the concrete in the conveyor drum as observed visually, or as determined by testing the composition of the concrete.

"The strength of the concrete from samples taken at successive intervals after charging the conveyor drum increased progressively according to the length of time of transportation.

"The difference between the lengths of time of initial set of the two cements used had no effect on the results, so far as such effects could be observed or measured in a test of this sort."

(6) Concrete Products

Committee C-3, in its report, recommended the tentative standard specifications for concrete building brick remain as ten-

tative for another year. It was said this recommendation results from the inability of the committee to agree with respect to the sufficiency of the present available data on the performance of concrete brick with respect to the relation between brick strength and strength of masonry.

In a paper on "Tests of the Stability of Concrete Masonry Walls," made at the University of Illinois by F. E. Richart, P. M. Woodworth and R. B. B. Moorman, a detailed report of results of tests of 60 concrete masonry walls; 42 "wallettes," or small walls; and accompanying tests of building units and materials were given. These walls were tested in compression, axial and eccentric, and in flexure.

The investigation was designed to study factors which influence masonry strength and to give further indication as to the essential properties to be specified for hollow concrete building units. The tests on wallettes were to establish a relation between tests on full size walls and on the smaller units. From the results of tests to date it is concluded that wall strengths are principally dependent on the strength of the building unit used. Later it was brought out in discussion by H. S. Brightly and H. H. Dutton that adhesion tests conducted show masonry mortar containing as much as 40% lime to 60% of portland cement are equal to a mortar of portland cement alone. The compressive strengths of the large walls of all types varies from 335 to 850 lb. per sq. in. It was also shown that the relation of strength of large walls to the 60-day compressive strength of units used was quite well defined. The average value of the ratio is 0.53.

Tests of walls made of 8-in. units with three oval cores showed the compressive strength with face-shell mortar beds was 80% of that produced by the use of full mortar beds. These results would seem to justify the use of this factor to estimate the strength of other walls.

Little definite effect could be established, it was said by Mr. Richart, who read the paper, as due to variations in type of aggregate, type of mortar or thickness of walls. Some differences found with three types of units could be explained by the arrangement of cross-webs of the units.

This series of tests also show that composite walls of face brick and concrete building units had good inter-action of the two types of unit, and quite satisfactory strengths, even though the walls developed a marked deformation and deflection before failure.

The flexural strength of the walls was said to be a function of the adhesion of the mortar to the bearing surface of the unit, since all transverse failures occurred at the juncture of the two materials. Values of the modulus of rupture for the walls varied from 18 to 50 lb. per sq. in. If increased flexural strength of walls seemed desirable it might be accomplished by securing a rougher texture of the bearing faces or by wetting the faces to produce an optimum "suction" between unit and mortar.

Tests were also conducted to determine the effect of eccentric compressive loads. It was found that where this load was applied at the edge of the middle third of the wall thickness strengths averaging 76% as great as with axial loading were obtained. It is also indicated by these tests of walls with full bedding that there would seem to be no difference in the efficiency of walls as based upon the strength of the units.

A report on "Tests of the Fire Resistance and Stability of Walls of Concrete Masonry Units" was read by C. A. Menzel, Portland Cement Association. The tests covered studies of the relation of such factors as type and grading of aggregate, cement content, design of unit, type of mortar, workmanship, and application of plaster on the fire resistance and load carrying properties of walls of concrete masonry units. The following conclusions have been drawn from data obtained in these tests:

"1. *Grading*—Tests with four widely different types of aggregate showed that, with a given cement content, the fire endurance period increased as the proportion of fine to coarse aggregate in the concrete mixture was increased in spite of the accompanying variations in the voids, weight and strength of the units.

"The effects of grading upon fire endurance period, however, were insignificant in comparison with their very marked effect on strength of units and corresponding strength of walls both before and after fire exposure. The proportion of fine to coarse aggregate should in general be based upon considerations of strength of wall rather than upon fire endurance.

"2. *Cement Content*—Tests with units made with three different types of aggregate and from mixes ranging from lean to rich (1:14 to 1:3 by volume) showed that the fire endurance period increased directly with increase in cement content regardless of the accompanying variations in the other physical properties of the units and the type of aggregate used. The increase in fire endurance period with increase in cement content ranged from about 20% to 35%, depending on the type of aggregate.

"The strength of units and of the corresponding walls made with each type of aggregate were for all practical purposes directly proportional to the cement content. Generally speaking, doubling the cement content resulted in an increase in fire endurance period of the walls of at least 10% and an increase in load-carrying ability both before and after fire exposure of about 100%.

"3. *Type of Aggregate*—With a given grading and cement content, the fire endurance period of 8-in. walls was substantially influenced by the type of aggregate used. The range in the fire endurance period for ten widely different aggregates was from 27% below to 27% above the average period of 152 min. for the group. When compared on the basis of fire endurance in minutes per pound of material per square foot of wall the four aggregates showing the highest fire endurance periods were nearly twice as effective as the two aggregates showing the lowest fire endurance periods. However, the results of tests of the other factors studied, showed that by the proper selection of type of unit, cement content, grading of aggregate, wall thickness, etc., any particular requirements can be met with any of the materials tested.

"4. *Design of Unit*—In tests of units of different designs made with calcareous sand and gravel aggregates of constant grading and constant cement content, a remarkably consistent relation between the fire endurance period and the weight per square foot of wall was found. There was a marked increase in the fire endurance period with increase in weight. In general, an increase of 50% in weight doubled the fire endurance period. The relationship appears to be fundamental and to hold regardless of the manner in which the concrete was distributed in the different designs of units. It shows that the effectiveness of a given type of concrete can only be improved by increasing the weight of the unit. Preliminary information from tests along the same lines with other types of aggregate have shown a similar general relationship between weight of wall and fire endurance period. When completed, these tests will provide a rational basis for design of walls to give any desired performance.

"5. *Effect of Plaster*—The fire endurance period of 8-in. walls was increased approximately 30% when finished with ½ in. of gypsum plaster on either the exposed or unexposed face and about 60% when finished with ½-in. of gypsum plaster on both faces. These tests covered walls made with two widely different aggregates. In general the application of plaster to one or both faces of the wall resulted in an appreciable improvement in wall strength after the same or somewhat longer periods of fire exposure.

"6. *Type of Mortar*—The fire endurance period of walls of both block and tile units laid up with five different types of 1:3 mortar ranging from straight lime mortar to portland-cement mortar was practically unaffected by wide variations in the cement-lime proportions.

"On the other hand, the strength of the walls both before and after fire exposure increased as the cement content of the mortar increased, maximum strengths being obtained with a cement content of about 70% of the total volume of cementitious material (roughly 2 volumes cement to 1 volume hydrated lime). A slight falling off in strength occurred with increase in cement beyond the optimum cement content of about

70%. In general, closely similar wall strengths were obtained both before and after fire exposure with 1:3 mortars ranging from 50 to 87% in cement content. From these results it appears that although the walls in this investigation were for the most part laid up with 1:3 portland-cement mortar plus 15% lime, the wall strengths obtained would have been little affected if any other mortar falling within the above range of cement contents had been used.

"7. *Type of Joints*—The type of joint used in laying up the walls had a much greater influence on wall strength after fire exposure than on the fire endurance period. Improvement in both fire endurance and wall strength was obtained principally by a more complete bedding of the units at the horizontal joints rather than by a more complete filling of the vertical joints. In the case of 3-oval-core block units, bedding the transverse webs as well as the face shells increased the fire endurance period only 4% but increased the wall strength after fire exposure about 75%.

"8. *Curing of Units*—Only a very slight and practically negligible increase in the fire endurance period resulted when the duration of moist curing of the units was extended from 1 day to 5 and 14 days. However, a substantial increase in the strength of the units resulted from the longer periods of moist curing and this was reflected in a corresponding increase in strength of the walls.

"9. *Combustible Content of Cinder Aggregate*—The effect of increasing the combustible content of soft coal cinder aggregate upon the fire endurance period of walls constructed of well-made cinder units was found to depend on the nature as well as the amount of the combustible material added. The fire endurance period was decreased about 10% with the addition of 17% of combustible material in the form of coke but increased about 10% with the same addition of soft coal. As a result of these diametrically opposite effects it was found that the fire endurance period remained constant as long as about equal quantities of both coal and coke were added, even though the total combustible content was increased from 16 to 33% of the dry weight of the cinders.

"The tests showed that soft coal cinders may contain a mixture of unburned coal and coke up to approximately one-third of the dry weight of the cinders without materially influencing the load-carrying ability of walls constructed of well-made cinder concrete block or tile units either during or after 3 to 3½ hr. of severe fire exposure.

"10. *Mixture of Two Different Aggregates*—The fire endurance periods of walls made from units containing a mixture of two widely different aggregates, which by themselves have different thermal properties and produce walls and units of different strengths, were approximately proportional to the volume of each type of aggregate used. The strength of the wall, the strength of the individual units, and the total expansion of the walls were found to be influenced in a similar manner.

"12. *Wall Stability*—One outstanding result of this investigation was the substantial load-carrying ability and safety of the walls before, during, and after severe fire exposure which was repeatedly demonstrated notwithstanding the many variables of composition and design of the units and of the type of mortar and workmanship employed in their construction.

"13. *Relation Between Strength of Wall and Strength of Unit*—One of the most useful and important developments of the strength tests was the establishment of a straight-line relationship beween the original compressive strength of the units and the compressive strength of the walls before and after exposure to fire. This relationship shows that the strength of the wall is approximately proportional to the strength of the units over a wide range in strength of unit, type and grading of aggregate, design of unit and cement content.

"14. The various relationships and data established by these tests provide basic information for the manufacture of concrete masonry units, from a wide range of available materials, which will produce walls meeting any given requirements as to fire endurance and strength."

(7) Concrete

Only a small percentage of the total quantity of concrete placed is deteriorating rapidly and cement and aggregates are seldom the cause, while carelessness and poor methods of application are usually to blame, according to Ephrem Viens, Canadian Department of Public Works.

With improved processes of manufacture, the fineness of cement has been increased. Owing to this it has been found that structural strength requirements can be met with smaller quantities of cement than were necessary a few years ago. Crushing strength is used to a large extent to measure the quality of concrete, but it is doubtful if a concrete containing only sufficient cement to give a strength as required on ordinary work will contain enough to secure the durability desired of it, according to Mr. Viens.

Concrete may be thought of as consisting of the aggregates surrounded and held together by a paste of cement and water. The durability of the concrete depends in a very large measure on the quality and quantity of this paste. For given materials and consistency, the water-cement ratio will determine the quantity of cement and will, therefore, be a determining factor in the cost of the concrete. Hence, in deciding upon the water-cement ratio to be used in any work, the nature of the structure in respect to exposure, the durability and structural strength desired, initial and maintenance costs should be considered.

In determining the proportions and quantity of fine and coarse aggregate to be used with a given quantity of cement paste, it should be borne in mind at all times that workability is absolutely essential if uniform and durable concrete is to be secured.

In the matter of mixing, the time and speed are two important factors. The mixing must be carried out for a sufficient time to insure a homogeneous mass. Where the mixing speed is variable, it should not be allowed to increase to such a point that there is any danger of the coarse aggregate being thrown to the outside of the mixing drum.

Contractors engaged in concrete construction would no doubt find it to their advantage if they made an effort to train their workmen in this work and to find continual employment for these men.

There are a number of men scattered across the country today who have devoted much of their lives to a study of concrete and they are pretty well agreed that where the material is handled in a satisfactory manner, its performance comes up to expectations. What is possibly most urgent today is the necessity that the knowledge which has been gained by the few be spread to others where it can be applied more generally; and particularly must those in ultimate charge of concrete work be impressed with their responsibility for the application of the better methods.

In a joint session of the American Society for Testing Materials and the Western Society of Engineers, the "Economic Significance of Specifications for Materials" was discussed. A paper by J. P. H. Perry, Turner Construction Co., on the "Use of Specifications from the Point of View of a Producer of Concrete" discussed the need of better specifications for concrete in construction work.

Mr. Perry pointed out the benefits of specifications for concrete, when properly written. He said such specifications resulted in gaining better concrete at lower cost. He recommended the elimination of all unnecessary description in specifications and suggested as an entirely satisfactory basis the water-cement ratio.

Mr. Perry said that often specifications, in attempting to specify concrete, contradict themselves by including conflicting requirements. The result of such inaccurate specifications can only be an increased cost of the concrete, since the contractor must base his estimate on the most severe interpretation of the specification. He also urged that greater consideration be given the source of aggregates before writing specifications. Specifications may be written so that local aggregates that can be used economically to get satisfactory concrete are eliminated from consideration by the contractor. Preliminary investigation of local aggregates before the preparation of these specifications might result in material savings in the cost of construction.

He said the method of curing was seldom adequately specified, and that admixtures were specified, but in such a way as to place all responsibility on the contractor for results. In pointing out developments that might eliminate the confusion now existant in these specifications he referred to certified concrete which can be purchased from central mixing plants.

Following this paper Arthur R. Lord read a paper on the "Use of Specifications for Concrete from the Consumer Viewpoint." This paper discussed the benefits of standard specifications as developed by the A.S.T.M. rather than specifications for specific projects, as Mr. Perry had discussed them. Mr. Lord cited the many benefits to the consumer from such specifications. To amplify his paper a series of pictures was shown illustrating the many uses of concrete and the flexibility necessary in standard specifications to provide suitable materials for the varied conditions under which concrete must perform.

Following the report of committee C-10 on Hollow Masonry Building Units it was announced by D. E. Parsons, U. S. Bureau of Standards, chairman, that a resolution had been passed by the committee asking the support of the A.S.T.M. in obtaining the consideration of the A.S.A. of standard sizes of masonry units for building construction. The resolution will be officially presented to the society at a later time.

(8) Lime

The report of Committee C-7 on lime recommended changes in the standard specifications for hydrated lime concerning chiefly paragraphs relating to soundness.

If new specifications are adopted, specifications for hydrated lime for all structural purposes will require that the lime pass the boiling test for soundness without popping or disintegrating.

(9) Gypsum

The report of Committee C-11 on gypsum included recommendations for standards and tentative standards for gypsum plasterboard, changing the size of the test unit to specimens 12x16 in. instead of the former size.

The committee also substituted the more definite term "gypsum lath" for the more general term "gypsum plaster board."

Gypsum products were defined as—

(1) *Gypsum plaster board*—"A sheet or slab having an incombustible core of gypsum, containing not more than 15% by weight of fiber, and surfaced with paper or other fibrous material firmly bonded to the core."

(2) *Gypsum wall board*—"A gypsum plaster board designed to be used, without the addition of plaster, for walls, ceilings, or partitions, and affording a surface suitable to receive decoration."

(3) *Gypsum lath*—"A gypsum plaster board, designed to be used as a base for the reception of gypsum plaster."

(4) *Gypsum sheathing board*—"A gypsum plaster board, designed to be use as a sheathing in buildings."

(5) *Gypsum concrete*—"A combination of aggregate or aggregates with gypsum as a binding medium, which after mixing solidifies into a conglomerate mass."

(6) *Gypsum fiber concrete*—"Gypsum concrete in which the aggregate consists of shavings or chips of wood."

Proposed tentative specifications were included for gypsum wall board, gypsum lath, and gypsum sheathing board.

In the discussion of fire resistance of concrete masonry walls it was brought out that ½-in. of gypsum plaster on one side of the wall increased fire resistance about 30% and that the same ½-in. on each side of the wall would increase the resistance about 60%.

(10) Slate, Stone and Miscellaneous Rock Products

In a paper by G. F. Loughlin, U. S. Geological Survey, on "Weathering of Stone," the weathering of granite, marble, limestone and sandstone was discussed. In general it was said granites containing mica crystals less than ⅛ in. in diameter withstand weathering satisfactorily. Where larger crystals are found results are less satisfactory. Marbles are subject to weathering when exposed to rain. When protected from rain marble may be considered durable.

In a paper by D. W. Kessler, U. S. Bureau of Standards, on "Test Procedures for Stone," he brought out the result of a test from which it was calculated that under conditions in the locality of the test the weathering on marble face would be a negligible factor. Mr. Kessler said if this test had been conducted with rain water instead of distilled water, the conclusions from the test might have been quite different.

It was said by Mr. Loughlin that limestone exposed to rainfall but not subject to the action of smoke would show a corrosion of approximately 1 cm. (⅖ in.) in 450 years. In New York City the corrosion might amount to as much as ⅛ in. in 50 years. He also said that where limestone is subject to the action of copper or bronze solutions, such as the base for a monument, chemical reaction occurs which results in deterioration of the limestone. There is also a leaching, or disintegration of limestone in contact with eastern seaboard river waters. There is no knowledge that such action would cause failure even over an extended period of time. In the Mississippi river valley the river waters have high lime content and no action of these waters on limestone has been found.

A recent test on a limestone that endured for several centuries in France showed that the material could be completely disintegrated by 18 freezing and thawing cycles when the specimens were frozen while partly immersed in water. The same procedure indicates low frost resistance for some of our domestic limestones which have shown good weathering qualities in service. However, it appears that for many building stones there is a better correlation between results obtained by freezing in water and the weathering in service than in the cases cited above, according to Mr. Kessler.

Refractories

In the report of Committee C-8 on refractories a number of changes in the Standard Method of Test for Softening Point of Fire-Clay Brick (C24-28) were proposed which represent recognition in the industry of an extension of the original purpose of the test to include not only fireclay brick but raw fire-clay and silica cement as well. The recommendation was unanimously accepted by the Society.

Also in this report it was announced that by arrangement with the U. S. Bureau of Standards, three new additional samples of magnesite, chrome and silica are being prepared. It was said that the addition of these samples would make available a complete line of the best known refractories now in common usage.

Exhibit of Testing Appliances Was New Feature of Meeting

For the first time, an exhibit of equipment and methods of testing were shown in connection with the meeting of the Society. Several laboratories had displays showing certain tests which they conduct in the control or improvement of their product. Many manufacturers of testing equipment, both domestic and foreign, were represented. Thermometers, screens, compression machines and many other products were displayed. An exhibit that attracted especial interest was one demonstrating automatic recording and temperature control equipment.

O. L. Moore Elected to Executive Committee of A. S. T. M.

AT THE ELECTION of the 34th annual meeting of the A. S. T. M. in Chicago, Ill., June 22-26, O. L. Moore, engineer of tests for the Universal Atlas Cement Co., Chicago, was elected to the executive committee.

Mr. Moore was graduated in 1914 as a civil engineer from Carnegie Institute of Technology and the same year entered the employ of the Universal company at its laboratory in Universal, Penn. In 1916 he was transferred to the Duluth plant of the company where he was in charge of inspection and tests and in 1917 was transferred to the inspection department of the Chicago office. He served here in various capacities until 1926, when he assumed his present position.

Recent Contract Prices and Prices Bid

FOLLOWING are some results of recent contracts let for public work and prices bid on rock products:

Duluth, Minn. Contracts for graveling state route 8 were let by the state highway department to Megarry Bros. of Bain, Minn. Their bid was $9632 for 12,300 cu. yd. of gravel to be spread over a 42-mile stretch of road.

Allison, Ia. Beu and Son of Sumner received the contract for graveling five miles of county road, involving 3800 cu. yd. of gravel, at 28½c and 30,400 additional half-mile unit hauls at 4.75c.

Port Angeles, Wash. A stretch of about 30 miles of the Olympic Highway has been awarded to the Port Townsend Sand and Gravel Co. at its low bid of $8568.50.

Leonardtown, Md. Bids on contracts for construction work were opened at the offices of the state road commission recently. Low bids were for 3.25 miles of concrete in Cecil county, $39,165.20 by the G. and L. Contracting Co., for 1.48 miles of gravel road in Charles county, $13,975.75, by the Dundalk Construction Co., and for 1.14 miles of gravel in St. Mary's county, $9185.20 by H. W. Hewitt and Sons.

Williamson, W. Va. The Hunt-Forbes Co., Huntington, was given the contract for six miles of concrete paving at a price of $112,529.50 recently.

Green Bay, Wis. Contracts recently awarded for crushed stone and gravel were to Theodore Van Straten, 800 cu. yd. of gravel at $1.45 per yd; Danen and Jansen, 900 cu. yd. of crushed stone at $1.60. For road repair work on approximately 1000 cu. yd. of stone their bid was $1.25 per yd. in the bin and 9c per yd. mile for hauling. Micholeck Bros. were low for material in Glenmore. Their bid on two different road jobs was $1.50 and $1.35. For approximately 1000 yd. for repair work the bid was $1 for stone in the bin and 8c per yd. mile for hauling.

Omaha, Neb. Low bids for gravel in this county were submitted by the F. L. Busche Co., bidding 35c per ton on gravel at the pit, 80c to $1 a ton on a sliding scale for gravel delivered at any railway station in the county and $1.19 delivered anywhere on the road.

Lincoln, Neb. Three companies were low on bids recently for gravel for state road maintenance work. The price of each of the three was $1.78 per cu. yd.

Dixon, Ill. Contracts for road work recently awarded are for gravel roads in Marion township to Nickle and Keetan at $1.09 per yd. delivered, in Sublette township to E. A. Pomeroy at $1.60 per yd. delivered and to D. B. Boyles in East Grove township at 89c per yd. and in May township at $1.19 per yd. delivered.

Joint Committee on Standard Specifications for Concrete and Reinforced Concrete

AT THE MEETING of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, held at the Stevens Hotel, Chicago, on June 22 and 23, considerable progress was made in the consideration of questions of concrete quality and problems of design.

In reference to design it was decided that the scope of the Committee's work should include all structures of concrete or reinforced concrete which require engineering analysis. The magnitude of this program necessitates a departure from the procedure followed in the 1924 Report which was a detailed specification with special application to buildings. The proposal is to confine the present report largely to a statement of the fundamental principles and assumptions upon which rational analysis of concrete structures may be based, with such amplification as is necessary for the design of specific structures.

Concerning the quality of concrete, the dual requirement of a minimum strength and maximum water-cement ratio is proposed. The purpose of the limitation of the water-cement ratio is to avoid the use of unduly lean mixes and thus to safeguard the durability of concrete. A change from the 28-day to 7-day strength requirement is also being considered.

Recent developments in the field of ready-mixed concrete have raised new problems not covered by the former specification. The Committee proposes to incorporate suitable provisions for the control of ready-mixed concrete.

Uses for Basic Slag

BASIC SLAG is a by-product of the blast furnace and formerly was a pure waste. At the present time it is used in many ways, and one of the uses is found in agriculture.

A number of tests conducted at Ohio State University have revealed the possibilities of slag as prepared for agricultural purposes as a propagating medium for the rooting of evergreen cuttings, and preliminary studies indicate that this prepared slag may be extremely helpful in other ways, such as modifying a very stiff clay soil often found about the new home where cellar excavation soil has been used in grading.

Agricultural slag is somewhat similar to a coarse sand; yet the individual particles are very unlike the small pebbles found in sand in that they are very absorptive of moisture, allowing the roots of plants coming in contact with them to obtain moisture over a long period of time. Therefore, slag is an excellent root former. In experiments conducted by H. C. Esper, of the Department of Horticulture at the Ohio Experiment Station, the roots of plants placed in clay pots, the pots subsequently being buried in slag, grew out of the tops of the pots, resulting finally in more roots in the slag than in the pots.

Since agricultural slag is quite alkaline in reaction, lime should not be used in conjunction with it, and acid-loving plants should not be planted in slag.

It must be remembered that all slag coming from a blast furnace is not in condition to use. It must be pulverized and of the right type for the purpose. Common road ballast slag would not answer the purpose.—*American Fertilizer.*

A. J. Hoskin Starts Consulting Practice

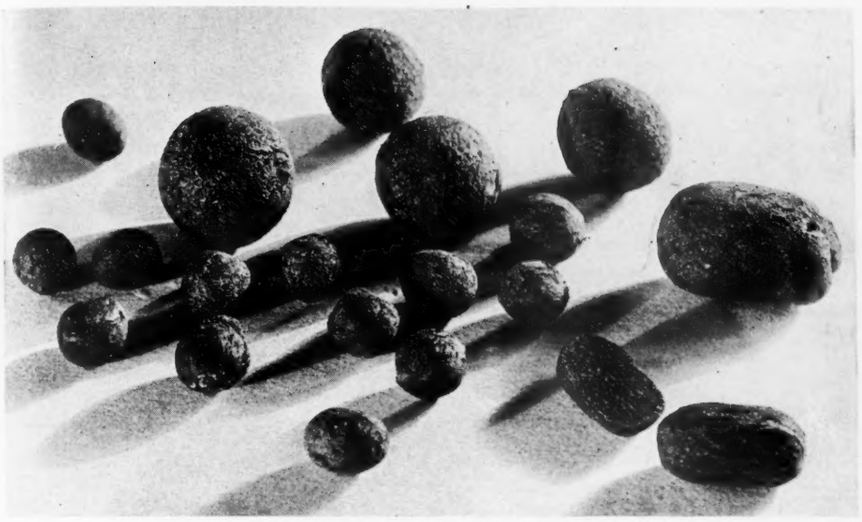
ANNOUNCEMENT is made by A. J. Hoskin, LaGrange, Ill., that he has resumed his practice as consulting engineer. He has had a broad experience in the mining and nonmetallic fields.

Mr. Hoskin is a graduate of the University of Wisconsin. After graduating he spent several years as assayer, mining engineer and on government survey work in Colorado. Six years were spent as assistant and professor of mining at the Colorado School of Mines. He then spent several years in various capacities in the mining department of the University of Illinois, and in research work for the American Railway Association, as consulting engineer on mining practice and oil shales, and as editor of a number of publications in the mining industry. For the past few years he has served as editor of *Pit and Quarry.* He has been active in the Western Society of Engineers, where he has served on many committees.

The wide experience Mr. Hoskin has enjoyed makes him thoroughly qualified to serve the mining and mineral industry as a consultant. His many friends wish him the greatest success in his new venture.

Comparison of Slag and Limestone on an Acid Soil

FROM A REPORT of greenhouse and laboratory tests by F. H. Crane it was found that on the gross ton basis 100-mesh limestone was somewhat superior to 100-mesh slag in its effects on red clover growth and soil reaction. On the basis of $CaCO_3$ equivalent, as determined by titration with phenolphthalein as indicator, the two materials had nearly the same effectiveness. The $CaCO_3$ equivalent computed from the contents of total Ca and Mg was a less satisfactory measure of relative effectiveness as compared with clover yields and effects on soil reactions than the $CaCO_3$ equivalent obtained by titration. Four-ton applications of granulated slag gave results approximately equal to those from 1 ton of 100-mesh slag.—*Chemical Abstracts.*



Various sizes of vesicullite. Note elongated shapes at right

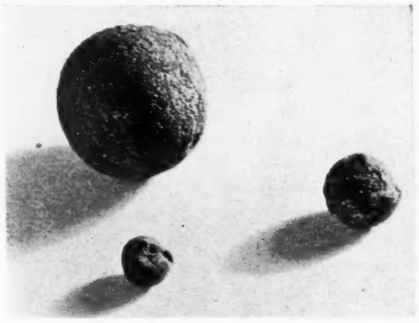
Light Weight Aggregate Developed in California

A VESICLE, or membraneous cavity, is an excellent way to describe the units of "Vesicullite," a recently developed material said to be suitable as a light weight aggregate for structural concrete.

Vesicullite is made by mixing with clay about 3% of ferric oxide and other granular carbonaceous materials. These materials have certain fluxing properties, as well as the ability to cause the mass to expand when heated, it is said.

The mixture is prepared in a plastic mix and extruded from an auger brick machine through a multiple die into a lot of round pugs. These are cut into short pieces and passed through a continuous ball rolling and coating machine which forms them in a globular shape and covers them with a coating of fire clay.

Then they are passed through a rotary kiln said to be above the fusing point of the centers but below that of the refractory coating. In this process it is said the softened centers expand from 4 to 7 times their original size. The outer coating remains fairly well intact during this expansion so that the finished pellet has a shell, varying in thickness according to the original coating. This shell is quite dense, compared to the body of the unit. About 20 minutes is required in the kiln to complete the expansion and fusion, it is claimed.



Vesicles 3/16-in. to 1-in. diameter are made

Shell thickness can be varied at will

Variations Can Be Made

This material is made in sizes of from ⅛- to 1-in. in diameter and is also made in an elongated shape, though most of the material produced so far has been round. The weight may be varied considerably, depending on the thickness of the shell, the amount of expansion and the gradation. Material thus far produced has weighed between 400 and 650 lb. per cu. yd. when of uniform size. It is said the crushing strength can be made as high as 4000 lb. per sq. in. The shell is of a dark brown color and the centers a greyish slate.

A kiln for the production of this aggregate has been set up in Alhambra, Calif., where experimental work has been proceeding. Knox Harding, a ceramic engineer, has been the directing hand behind this development.

Gravel Lease Approved

THE Illinois Commerce Commission has just approved a lease by the Illinois Central Railroad Co. to the Morton Sand and Gravel Co. of a gravel pit and plant at Forreston, Ill. The terms of the lease call for payment of an annual rental of $12,000 plus a royalty of 3 c. per yard on all sand and gravel which the Morton company shall sell commercially from the pit.

The commission in approving the lease found that the railroad company in times past operated several gravel pits to secure ballast for its road bed, but that conditions having changed, the railroad prefers to buy gravel in the open market and has sold all of its gravel plants except the one at Forreston. Could a buyer be found, the railroad would sell this pit, the commission learned.

Michigan to Hold State Cement Stock

THE STATE CEMENT PLANT at Chelsea, Mich., is carrying 175,000 bbl. of cement that will not be placed in competition with that manufactured by private companies, Charles W. Foster, secretary of the state administrative board, said recently.

The plant has been closed since March, and because of the present market price of cement, there is no need of the state entering the field, according to Foster.

With the signing of the Look bill giving the state administrative board the right to sell the plant, and terminating its operation in 1934 when it must be abandoned, the future of the plant is left with Governor Brucker and the other members of the administrative board.—*Muskegon* (Mich.) *Chronicle.*

Housewives Testify Favorably in Cement Dust Case

SEVERAL HOUSEWIVES residing in Concrete, Wash., appeared in the trial of Otto Pressentin here recently to testify that dust from the plant of the Superior Portland Cement Co. has caused them little or no inconvenience. Four women were called to the stand by the defense to counteract the testimony of Mrs. Pressentin.

Mr. Pressentin is suing the cement company for damages amounting to $10,450, claiming that dust from the plant ruined his farm, which is near by.

After the selection of the jury the talesmen were taken to Concrete to inspect the Pressentin farm. Testimony started June 11. —*Mt. Vernon* (Wash.) *Daily Herald.*

Safe Practices in Cement Plants Discussed at Detroit

Representatives from Three States Have a Day of Intensive Study of Better Safety Methods

ON TUESDAY, May 26, at the Book-Cadillac hotel in Detroit, Mich., representatives of the cement mills of Michigan, northwestern Ohio and Wisconsin gathered for their annual meeting in the interests of accident prevention. All of the mills within this area which are operated by association members were well represented.

George W. John, assistant superintendent of the Petoskey Portland Cement Co., acted as chairman and was assisted by a committee of operating executives. Herbert A. Browne, superintendent of the Wyandotte mill, presided at the afternoon session, and W. M. Powell, safety director of the Medusa Portland Cement Co., acted as toastmaster at the dinner.

Following closely the successful arrangements of several earlier regional meetings of the year, the program included a number of subjects of special interest at the present time. It was as follows:

Morning Session

A report of the progress of accident prevention in the cement industry during 1930 was given by Stanley Owens, safety engineer, Portland Cement Association, Chicago.

Five minute discussions on "The One Most Effective Safety Idea Used by Our Plant Last Year" were given by Owen R. Twite (Huron, Alpena), R. E. Minogue (Manitowoc), John R. Stearns (Peerless, Detroit), J. R. Wellman (Peerless, Port Huron), M. M. Lesher (Petoskey), Carl Fisher (Wyandotte), Charles Fuchs (Medusa, Bay Bridge), Wm. S. Smith (Ford, Detroit).

The resulting general discussions occupied the entire remainder of the morning session.

Afternoon Session

The afternoon session opened with a symposium, "How We Organized Our Plant to Win a Safety Trophy." It was participated in by R. E. Minogue (Manitowoc), E. C. Switzer (Petoskey), read by M. H. Sik, Charles Fuchs (Medusa, Bay Bridge).

"Don't Let Down on Safety Work During Hard Times" was the subject presented by George Opp, safety director, Detroit Edison Co., while "Investigations of Accidents" was discussed by W. M. Powell, safety director, Medusa Portland Cement Co., Cleveland.

Several of the papers presented at the meeting are reproduced as follows:

How We Organized Our Plant to Win a Trophy

By R. E. MINOGUE
Manitowoc Portland Cement Co., Manitowoc, Wis.

Our last lost-time accident occurred on October 2, 1929. About this time our representative to the annual conference of the National Safety Council returned, very much worked up over the fact that in the cement section it was definitely brought out that the major causes of lost-time accidents rested upon the shoulders of those supervising the operation of the plant and the different departments. Up to this time we had assumed that safety work was a matter of guards and education of the men in the plant. However, the report which he brought back from this meeting convinced us that there was still more to safety than just guards and education. Guards are, without a doubt, essential, and there is no question about education; but there is still more. By definitely placing the majority of causes for lost-time accidents upon the shoulders of those supervising the operation of the plant and its different departments, it was placed upon those whom we depended on to educate the men in the plant in safety. In other words, the superintendent, assistant superintendent and foremen were considered as educators. We all know, however, that some of our best educators are really the worst offenders of their own doctrine, and it was with this thought in mind that we started our 1930 campaign for the trophy.

Our safety committee, which had been reorganized the previous year, consisted of the superintendent, assistant superintendent and all foremen, with the chief clerk acting as secretary. They held their regular meetings on alternate Tuesdays, and between meetings each foreman was required to hold a safety meeting of his department, at which all men were required to be present unless excused by him for some good reason. A written report of each foreman's meeting was then read at the following meeting of the safety committee.

Our intensive campaign for the 1930 trophy was started in October of 1929 by a message from our superintendent to the safety committee, in which he very definitely stated his convictions as to the responsibility of the cause of lost-time accidents, and the attitude which would be taken by all, from the management down to the yard man, during the 1930 campaign. This attitude was not exactly a hard-boiled attitude, as has been mentioned by some, but it was a stern and strict attitude that required a more definite placing of the cause of even minor accidents, and also action from the safety committee in regard to the careless workman and those who violated safety regulations in the plant. Even those failing to report small scratches or bruises to the first-aid department were considered as much violators as those having near lost-time accidents.

It is very easy to sit down and make out an "A1" set of safety rules for a plant, but unless the man who is expected to obey these rules can realize for himself that he has an advantage over the man disobeying them, it is only a waste of time to write them. It was therefore our intention to show this man who obeyed safety regulations that his job was more likely to be steady than the man disobeying them, by demanding more action from the safety committee.

Next came our safety rally on December 18, 1929. It is needless for me to detail the advantages of a meeting of this kind, as I am sure we will all agree that the pep and enthusiasm injected into an organization through these safety rallies or get-together meetings can be obtained by no other means. This completed our preparations in 1929, and we were set for the trophy drive for 1930.

Soon after the first of January, 1930, our safety organization was put under the general supervision of W. M. Powell, safety director of the Medusa Portland Cement Co., of which we had become a part. Too much cannot be said of the influence of a good safety director. His personal contact with every man in the organization certainly produces results, especially where his personality is of such a nature that it readily convinces the individual that he is a firm believer in the doctrine he preaches. This, we soon found, was the type of safety director we had been put under.

One of the first steps after coming under the supervision of the safety director was the installation of departmental safety record boards, which were kept up by the men in that department daily and checked by the foreman and chairman of the safety committee against our large plant record board. All boards showed the number of days since the last lost-time accident in that department, the number of days since the last acci-

dent of the current calendar year, and the number of days to go to win the trophy.

Our progress through the year was marked by a firm stand on all safety regulations and immediate action by the safety committee on all minor accidents of the more serious nature. Men violating safety regulations were immediately brought before the safety committee for such action as they should recommend. Men absent and unexcused from foremen's or departmental meetings were also brought before the safety committee for such action as they should see fit. An investigating committee was appointed by the chairman of the safety committee for each individual minor accident of a serious nature. This committee was appointed immediately after the accident was reported, and instructed to interview the man, get all details, and turn in a written report to the chairman of the safety committee before the beginning of the injured man's next shift.

The safety committee's recommendations ranged from giving the man another chance, giving him two weeks off work without pay and without a definite promise of going back to work at that time, to laying the man off altogether; and in each case the committee's recommendation was observed.

Operating under this system, with a safety rally about every three months and with our safety director constantly keeping in touch with the personnel of the plant through our monthly safety paper, we finished the year 1930 without a single lost-time accident and won the trophy.

We are now continuing the drive for the 1931 trophy under the same stern and strict attitude taken in 1930, for it is our conviction that to produce an organization of thoroughbred safety-thinking men it is necessary to protect your thoroughbreds by culling out those who are not thoroughbreds.

By E. C. SWITZER
Superintendent, Petoskey Portland Cement Co., Petoskey, Mich.

The medium through which we worked to acquire the safety record for the year 1930, which won for us the safety trophy, was our safety committee. This committee was first organized in 1922 and its personnel included the superintendent, assistant superintendent and foremen, the latter being always, in our estimation, the key-men in any safety program.

During that year and the years 1923, 1924 and 1925, this committee endeavored to educate our employes to operate our plant without lost-time and fatal accidents; but, due to irregular times of meeting and lack of interest on the part of the greater portion of the men, and the inability of the committee to make the men understand that other than selfish interests on the part of the company were involved, failed to function, and accidents and fatalities were ever on the increase.

In December of 1925 our executive officers announced the first annual dinner for our employes. Every employe was ordered to be present at this dinner. No excuses, except serious illness or death in their families, were recognized. At this dinner our president presided as chairman and he and other officials told our employes, in plain words, that accidents in our operations had to stop, that careless workmen had to be eliminated, and that, unless our employes as a body began to show more interest in their own welfare than had been manifested in the past, new men would be sought to accomplish the desired result, namely, the elimination of accidents. The responsibility of carrying out the program announced was placed upon the shoulders of the superintendent and his assistant.

Left to right—Stanley Owens, Portland Cement Association; W. M. Powell, Medusa Portland Cement Co.; George Opp, Detroit Edison Co.; Herbert A. Brown, Wyandotte Portland Cement Co.; Geo. W. John, Petoskey Portland Cement Co.

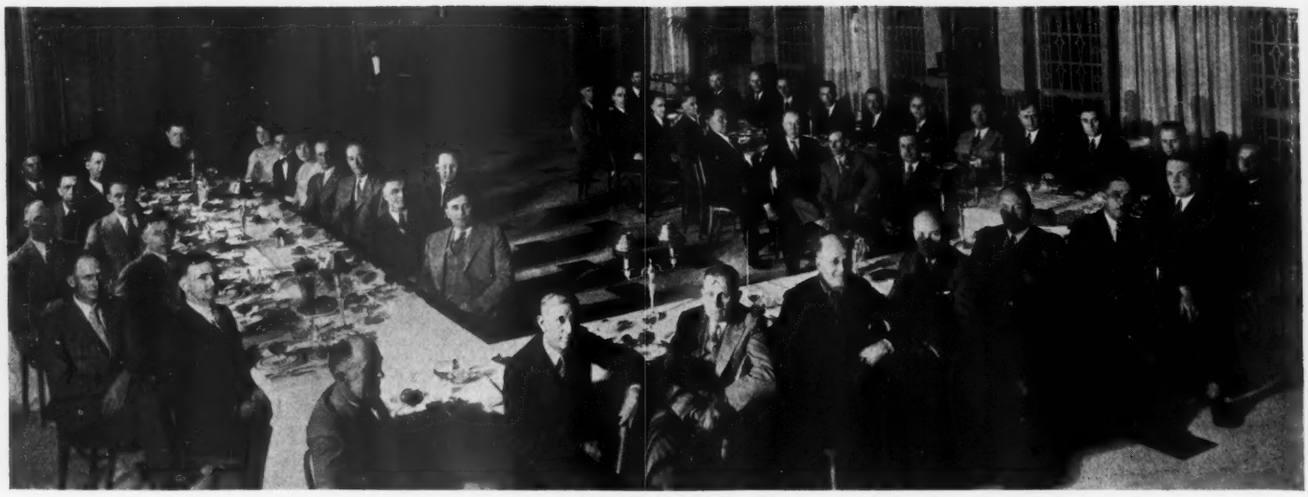
The superintendent and the safety committee went to work. The assistant manager was made a member of the committee, which otherwise, as to personnel, remained the same. From that day until the present the committee's regular meeting time has been 10 o'clock every Monday. Minutes are kept of each meeting. Two members of the committee were first appointed each week as inspectors, one inspector to go through every part of the plant and report back to the committee any dangerous practices on the part of the employes, any bad housekeeping, unguarded machinery, unsafe platforms, walkways, stairs, ladders, etc., that he had observed. The other inspector makes a similar report on the yard, quarries and crushing plant. Later these inspectors were chosen by members of the safety committee, from among the mill and yard men, in order to get more men actively engaged in the safety work. These inspections are usually made on Monday morning, before the time for the safety committee meeting, and are discussed at the meeting. Foremen are instructed to interview men on dangerous practices, to have dirty parts of the mill cleaned up, and defective equipment repaired at once.

The revivified committee work disclosed many unsafe practices which were corrected, without many men being discharged, though a few would not comply with the safety regulations, and their discharge gave the men to understand that the orders of the management were going to be carried out, and immediately new interest in safety was noticeable among the employes.

For minor accidents, not involving lost time, and lost-time accidents, the employe concerned is called in before the safety committee and his accident thoroughly discussed, his fault pointed out, and he is cautioned not to appear before the committee again for a like accident. This procedure has had a very good effect upon the employes, for they know that too frequent appearance before the committee will result in their names disappearing from the payroll.

As compared with the years 1922 to 1925, the success of our efforts toward accident prevention in 1926, 1927 and 1928 showed wonderful improvement. In 1929 our record showed a backward tendency, which we attributed, among other causes, to a little letting down in our vigilance in carrying out the program announced at the dinner in 1925. At the dinner that year the writer again called the attention of our employes to what the management ordered in 1925, and stated that we were going to make another real drive for accident prevention; that careless men were going to be dismissed from our service; that our safety rules and regulations must be obeyed. We very soon had to discharge two men for careless driving of their automobiles into and out of our plant, and another man was laid off for ten days for a piece of carelessness in handling his car on the company's premises. These disciplinary measures had the desired effect and we completed the year 1930 without a lost-time accident.

Our experience in accident prevention proves conclusively that the co-operation of management and the operating forces must be had to acquire a good record. The management must put just as much stress on safe operation as upon efficient operation and demand both. The superintendent must de-



Dinner of mill representatives at the regional safety meeting, Detroit, Mich.

mand of his foremen that they be so thoroughly familiar with the operations in their charge that they can instruct their men in how to do their work safely, and that they insist that their men work safely. The foreman is the key-man in accident prevention, and a good foreman will pay just as much attention to how his men work, with respect to safety, as he does to getting the work done as thoroughly and as cheaply as possible. Safe and efficient work go hand in hand. They cannot be divorced and good records made.

The One Most Effective Safety Idea Used by Our Plant Last Year

By OWEN R. TWITE
Huron Portland Cement Co., Alpena, Mich.

Penalizing violations of the safety rules was the most important thing done in 1930 to reduce the number of lost-time accidents at our plant.

Almost all violations of the rules are punishable by some form of penalty. This is done to firmly impress upon the mind of the guilty the fact that he is not permitted to endanger the lives or welfare of the people of the community in which the crime was committed.

A careless act endangering human life in any public building or on any public highway is punishable by some kind of penalty, usually by a fine or imprisonment or by both.

Is it any less a crime to endanger your own life or that of a fellow workman while employed in a manufacturing plant or any industry not generally spoken of as being a public place?

Conceding it is no less a crime, why, then, is it not just as necessary to apply a penalty to prevent repetition of this or a similar act of carelessness?

Seeing friends or acquaintances haled into court to face violation of the law, with the ever accompanying penalty and unfavorable publicity, makes us strive to be careful, law-abiding citizens.

So, too, does the shame of unfavorable publicity given a violation of one of the laws of safety make us more careful in our daily tasks in an industrial plant. Using this line of reasoning, the members of the safety council, heartily supported by Superintendent W. P. Harris of the Huron Portland Cement Co., on December 8, 1930, passed a resolution placing a penalty upon the person or persons found guilty of carelessness in causing an injury to themselves or fellow employes.

As in violation of laws pertaining to the public, the courts of justice, after carefully considering all the evidence available, arrive at a just penalty, we, too, after thoroughly investigating each accident, try to be as just and impartial as possible in arriving at what we think is a proper penalty. As the judge in a public court "whacks" the pocketbooks of the careless to try to make them remember to be careful, so do we, not by fining or imprisonment, but by a short or a long layoff, according to the magnitude of the crime committed.

As this is the only practical method at our disposal of impressing the desired effect upon the guilty, as well as informing all other workmen of their penalty should they become careless, we use it with encouraging results.

The number of lost-time accidents at our plant is steadily decreasing, and we of the safety council of the Huron Portland Cement Co. firmly believe it to be largely due to the fact that we penalize violations.

By JNO. R. STEARNS
Peerless Cement Corp., Detroit, Mich.

In order to teach the workman safety we organized what we called the "kangaroo court." This court is presided over by a judge, selected by the men by vote, to serve for one month, and an associate judge to act when the judge is unable to do so. The associate judge is judge on the following month, and the new man selected acts as associate judge that month. The selection is made on the first day of each month. The judge selects a jury of five men who decide the guilt or innocence of the person on trial. The case is well talked over during the trial and the possible results pointed out.

At first the judge selected one or two men unknown to the rest to act as private detectives and report such cases as they could see. The men tried were those who were found using unsafe methods that were liable to lead to accidents but had not so far, due to luck in many cases. After the first couple of court sessions, which are held from 12:15 to 1 p.m. on each Monday, in the machine shop, the judge had no need of detectives, as everybody was keen on the project and reported guilty practices.

I will give you a few of the charges that were brought before this court: Using an electric welder in an exposed position; grinding without goggles; using a file for chisel and pounding on same; carrying an open knife in apron pocket; and leaving hand rail off slurry tank, opening in kiln building, while agitator was being repaired.

The penalty was usually the wearing of an apron or cap on a trip through the mill with the reason printed on it, or a pair of goggles with a patch over the lens and a man to lead him; and on one occasion the first-aid team treated the guilty person for broken leg and left him trussed up during the following court session.

We all think that the "kangaroo court" put safety in mind and mouth of more men than anything that we have done.

It is a common thing to hear, "Better watch your step, or the 'kangaroo court' for you," which is a sure sign that the men are thinking safety, and when they think safety they usually work safely.

By J. R. WELLMAN
Peerless Cement Corp., Port Huron, Mich.

My first recollection of safety methods was the appearance of safety signs used by the railroad companies. Signs were installed around the properties of the roads, and at

every railroad crossing you could see them. This was splendid advertising for safety, and the majority of the people were more careful because of this. Gradually other industries took up the watchword of "Safety First," until today it is a universal slogan.

We have stressed the idea of educating the employe in safety, but we cannot stress that point too much. I believe that education of the workman in safety first is one of the greatest factors. The workman should know all about safety, and then he can practice it.

In our plant the key-men are held responsible for the safety work. Safety meetings are held twice a month. Each of these meetings is in charge of a foreman who has been appointed at the previous meeting. It has been found that this plan brings out more ideas from the men, and that they feel freer in their discussions than if the superintendent or safety director were in charge. Each month a safety committee of three men is selected from the workmen to make an inspection of the plant. Each department is inspected, and reports are made to each foreman on his respective department. Changes or corrections that are necessary must be made, if possible, before the next safety meeting, and are reported to that meeting. Then, too, the foremen are required to hold council with their men about safety work not later than the following day.

Also, posters play an important part in our safety work. Three bulletin boards conspicuously placed are used to keep the idea of safety continually in the minds of the men. Posters are changed on these boards twice a week.

What I believe was the most effective idea used in our plant in 1930 to reduce accidents was the plan of giving to each department a green flag with a white star on it, a replica of the flag used in the June no-accident campaign. This flag was placed in a conspicuous place so that everyone could see it and be reminded of safety first. In case a lost-time accident occurred in any department that department lost its flag and was given a white flag to replace it, which flag it must fly until the end of the month. Or if an accident occurred during the last week of the month the department would have to fly the white flag the following month. This idea caused considerable rivalry between the departments, and no man wanted to suffer the disgrace of causing his department to lose its flag.

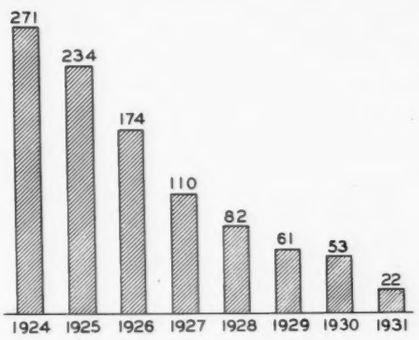
Standard Specifications for Batcher Weighing Devices

A RECENT BULLETIN, No. 15, issued by the American Road Builders Association, contains specifications for weighing devices for use with the bin batcher and central mixing type of plant and for small mixers of ½-cu. yd. capacity or less.

May Accidents in Cement Plants

ACCIDENT frequency in the member cement mills of the Portland Cement Association slumped again in May. Last month 20 lost time and 2 fatal accidents occurred, as against 50 lost time and 3 fatal accidents during May, 1930. May accidents this year were also less numerous than those suffered during April, an encouraging record in view of the larger production and the increased operating personnel during May.

One of the fatal accidents occurred to a quarry employe engaged in operating a trip rope attached to a large shovel. The cable snapped and he was crushed to death under the falling dipper. The cable is reported to be new and was inspected shortly before the accident. An investigation is still in progress.



May accident record for eight years

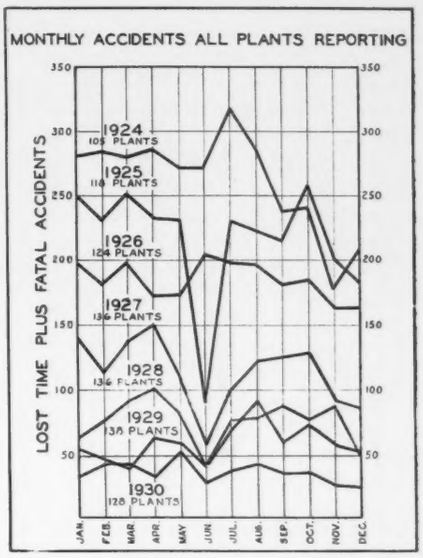
A stone belt operator entered a stone bin presumably to trim down sides. Apparently the stone caved in from the sides of the bin, pinioning him and causing death by suffocation. There were no witnesses and difficulty has been encountered in determining the underlying causes.

Both of these fatalities occurred in plants which had previously won the Association safety trophy and where all recommended safety devices and safety rules had been adopted.

Final Figures for 1930

Final revised figures covering accidents in plants of cement association members during 1930 have just been completed. The table below comparing general features of the record for several years indicates the outstanding progress which has been made.

It will be noted that the frequency of fatal accidents declined more than 50% while the lost-time accidents declined about 39% from the 1929 figures. Days lost declined only slightly; but because of the large reduction in fatalities and the lesser number of permanent disabilities, the accident severity rating for the year is considerably less. The monthly accident rate



Monthly accident rate for years 1924 to 1930

for all mills reporting is shown for the years 1924-1930, in the accompanying graph.

Years	No. of Plants Reporting	Man-Hours	No. of Lost-Time Accidents	No. of Days Lost	Days Lost Per 100,000 Man-Hours	No. of Permanent Disabilities	No. of Fatalities
1926	124	97,380,785	2,172	44,181	45.3	67	45
1927	136	93,871,081	1,339	33,172	35.3	67	30
1928	136	85,796,645	877	28,363	33.1	75	33
1929	138	75,739,429	686	17,751	23.4	55	37
1930	128	69,727,954	420	17,114	24.5	48	18

To Investigate Sand Contracts

THE SAND, GRAVEL and cinder contracts of New York City are being examined by the Hofstadter legislative committee. Samuel Seabury, chief counsel, said recently he had subpoenaed witnesses in this connection but refused to name them.

Mineral Industries Committee

THE BOARD OF DIRECTORS of the Western Society of Engineers, Chicago, Ill., has appointed the following members upon the Mineral Industries committee for the year beginning June 1, 1931: Chairman, E. T. Lednum, manager Chicago office, E. I. Du Pont de Nemours & Co., Inc.; M. M. Leighton, director, Illinois Geological Survey, Urbana, Ill.; A. J. Hoskin, consulting mining engineer, recently editor *Pit and Quarry*, LaGrange, Ill.; A. C. Noe, professor of paleobotany, University of Chicago; C. C. Whittier, consulting engineer, Robert W. Hunt Co., Chicago; W. D. Langtry, W. D. Buchanan, T. C. Mullins and J. D. Burlie, all of Chicago.

Buffalo, N. Y., Reports Limestone Trade Improves

THE STEAMER *Lebanon* brought a cargo of stone to Buffalo, N. Y., June 18. The latter commodity has been coming down the lakes to Buffalo in extremely heavy proportions since the opening of navigation. Approximately 15 cargoes of stone have arrived during the last two months. It was estimated by marine men that more than 100,000 tons of stone have been unloaded here.

"If the present pace is maintained the lake trade in limestone, which declined perceptibly in 1930 under the influence of the general depression, should swing back to normal," said one official recently. "Until a few years ago limestone as a flux movement was so sensitive to the fluctuations in the country's iron ore production that it closely followed the trend in iron ore.

"However, the iron ore loss of 1930 amounted to 28.56%, while the loss in limestone was only 23.52%, thus evidencing the large use that is being made of limestone in other fields. The iron ore trade this year has not progressed as rapidly as in other years to date, while the trade in limestone has been steady all season. It bids fair to again eclipse the 10,000,000-ton mark for the seventh successive year."—*Buffalo* (N. Y.) *Courier-Express.*

Domestic Graphite Sold in 1930

THE TOTAL QUANTITY and value of graphite sold by graphite miners in the United States in 1930 were considerably smaller than the corresponding figures for 1929, according to a statement by the United States Bureau of Mines, Department of Commerce. The sales of natural amorphous graphite by producers in 1930 were 1941 tons, valued at $20,525. In comparison with 1929 there was a decrease of 1641 tons, or 45% in quantity, and of $26,125, or 56% in value. Because only two operators reported sales of crystalline graphite in 1930, it is impossible to publish figures without disclosing confidential information.

The states reporting the sale or use of graphite by the miner in 1930 were Alabama, Michigan, Nevada and Rhode Island. Alabama was the only state reporting sales of crystalline graphite in 1930.

The foregoing figures represent the sales or shipments of graphite. The production figures are somewhat different. Only one amorphous graphite mine was in operation in 1930, that of the Carson Black Lead Co., in Nevada. Two other operators used or sold mineral from stock mined previously.

The imports of graphite in 1930 amounted to 16,726 short tons, valued at $531,642, in comparison with 24,072 short tons, valued at $1,066,834, in 1929. The 1930 imports represent a decrease of 31% in quantity and of 50% in value from the preceding year.

City Street Paving Materials Survey

THE EXPANSION of city street paving which characterized the 10 years ended December 31, 1929, reached its climax in 1927, with decreases reported for 1928 and 1929, according to a survey of 201 representative cities made by A. H. Redfield of the United States Bureau of Mines, Department of Commerce. The upward trend, followed by a decline, was general in cities of all sizes included in this study, but was most pronounced in cities of 40,000 to 100,000 inhabitants and in the northeastern, southeastern and southwestern states. In the north-central states the trend of paving was downward from 1925 to 1929; in the Pacific and Rocky Mountain states it was upward.

Over the United States as a whole, bituminous types of paving continued to lead, furnishing two-thirds of the total street pavement laid in the 201 cities from 1925 to 1929. The actual yardage of bituminous pavement laid in these cities, however, was 3.8% less in 1929 than in 1925, and the ratio of bituminous pavement to the total pavement dropped from 70.4% in 1925 to 62.1% in 1928, rising to 65.1% in 1929. The area paved with portland cement concrete amounted to one-fourth of the total pavement laid in these cities from 1925 to 1929, but the yardage increased by half during the period, and its share in the total pavement grew from 19.3% in 1925 to 30.0% in 1928, declining to 28.5% in 1929. Brick, block and stone pavements, which constituted the remaining one-twelfth of the total pavement laid in the 201 cities, decreased one-third in yardage, and declined in relative importance from 10.3% in 1925 to 6.6% in 1929.

The cities included in the survey comprise 94.5% of the population of the United States living in communities of over 40,000 inhabitants. The purpose of the survey was to obtain over a series of years comparable figures from a sufficient number of representative American cities to permit the study of trends or tendencies in city street paving.

Find New Kaolin Deposit in North Carolina

ALREADY LEADING the nation in the production of high grade residual kaolin, North Carolina's prestige in this field is expected to increase with the discovery of what is believed to be the largest deposit of this mineral in the state, and one of the largest in the United States, State Geologist H. J. Bryson said recently.

"Drilling to date," asserted Mr. Bryson, "shows several million tons of crude clay of the highest type. Drilling has been checked by this office, showing a depth of approximately 100 ft. of clay over an area of 100 acres. This is by far the largest deposit yet found in the state.—*Kingston* (N. C.) *Free Press.*

Wisconsin Editor Comments on State Cement Plant Operation

A FAIRLY GOOD EXAMPLE of the futility of the state entering the field of private enterprise is that offered by Michigan's experience in the operation of a cement plant.

Originally purchased a few years ago during the administration of Governor Groesbeck and based on alleged evidence that private manufacturers were gouging the state on the price of cement for large public road improvements, it was very soon disclosed that the state plant could not profitably manufacture cement in competition with private industry. The operation thus far shows a net loss of over $600,000.

That the state plant might have produced cement profitably by good management during the past few years of prosperity is a matter of conjecture, but that it did not, even with a mill quite up-to-date and with the help of some convict labor, is a matter of fact.

Confronted by this experience, the state legislature has decreed, with the approval of Governor Brucker, that the state cement plant be sold or dismantled before 1934.

Six hundred thousands dollars is a high price for a state to pay to prove that talk is easy and work is still difficult, but it is a relatively cheap price to pay for a lesson if the people will only remember it.—*Appleton* (Wis.) *Post.*

Rock Products Activities in North Carolina

HENRY BAILEY of Penland, N. C., and H. E. Deneen of Spruce Pine, N. C., plan to establish a kaolin mining and refining plant near Bear Creek, where a large deposit of china clay will be worked to supply the plant, according to reports current here. Producing a major portion of the kaolin mined in the United States, the mines of North Carolina supply kaolin to local plants for refining, the output then being sent to Ohio and New Jersey to be made into various ceramic products.

Feldspar mining in the Spruce Pine district continues at less than capacity, but it is reported that the Bon Ami Co., New York, which obtains a large amount of feldspar from local mines, will open a large deposit at the head of Crabtree creek. It is understood also that W. S. Robinson, general superintendent of factory operations for the Bon Ami Co., has arranged with J. C. Pitman to conduct extensive mining operations on property owned by the company on Clak mountain, both for mica and feldspar.

New York interests are said to have acquired deposits of cyanite, a new refractory material, in Yancey county and also the same interests may announce plans soon for a kaolin plant in Avery county.—*Manufacturers' Record.*

"Cast Stone" Remains Cast Stone

ANOTHER of the Federal Trade Commission's attempts to limit and restrict the application of trade terms in common use was blocked by the Circuit Court of Appeals at New Orleans, La., May 25, in the case of Arnold Stone Co. vs. Federal Trade Commission.

The commission had issued an order directing the company to cease and desist from using the terms "cast stone" or "cut cast stone" for building material composed of about 75% natural stone and 25% cement, unless the word "artificial" or "imitation" were added to the description. It was admitted by the commission that architects, contractors and building material dealers were not misled by the terms, but they "had the capacity and tendency to mislead, deceive or confuse the purchasing public, and particularly secondary purchasers of completed buildings or lessees thereof."

The court, however, found that there was no evidence that any actual deception had ever taken place. The court said:

The sum and substance of all the evidence was that the words "cast stone" were understood by petitioner's prospective customers and by its competitors to mean just such a product as petitioner manufactured and sold. None of them understood that by the use of those words it was intended to describe stone in its natural state. In the building trade in which it is exclusively used, cast stone has come to mean a genuine manufactured article composed of crushed natural stone and cement; and to qualify it by the word "imitation" or "artificial," as required by the commission's order, would convey the meaning that it was not a genuine manufactured article. But to sustain the commission's order reliance is had on its finding that a purchaser or lessee of a completed building, in the construction of which petitioner's products had been used, might be misled or deceived. That finding or inference is not supported by any testimony, and at best is founded upon a very remote possibility for the occurrence of which it is difficult to conceive that petitioner would be responsible.

Open New Lime Plant in Washington

WITHIN FIVE MILES of Wenatchee, Wash., a supply of 99% pure lime was opened June 13 by Harry Bridges, local building contractor. Lime from this deposit on the Entiat road was used in putting up buildings 30 years ago.

Mr. Bridges says he has exposed one ledge 20 ft. wide and over 1000 ft. long.

The finished product will be turned out by the last of July, Mr. Bridges says. Government analysis shows it tests 98.86% pure.—*Wenatchee* (Wash.) *World.*

Water Penetration Through Brick and Mortar

AS THE RESULT of a study of water penetration into brick masonry conducted at the U. S. Bureau of Standards it has been shown that when the interior walls of brick buildings become wet during a rain it is likely that water has entered through open spaces between brick and mortar rather than directly through these solid materials. Such openings may be produced either by poor workmanship or by shrinkage of mortar. If there are no openings of this sort, the probability of penetration by water through solid 8-in. brick walls is exceedingly remote under normal climatic conditions and if proper precautions in the way of design have been taken. One very necessary precaution is to avoid plastering directly on the brick in an 8-in. wall, and this may be accomplished either by furring the wall or by the use of metal ties in place of header brick. The time required for water to travel through a brick, thence through a mortar joint, thence through another brick, is far greater than the time taken for water to penetrate the two bricks and the mortar joint when these materials are tested separately and out of contact with one another. Probably one reason for this is the fact that the pores in one material do not communicate directly with those in the other material. It is also known that a brick must become highly saturated before it transmits water to another material. This degree of saturation is not attained when the brick is merely wetted through.

State Operates Rock Crusher

THE KENTUCKY state rock crusher is now grinding agricultural limestone near Roseville, Ky. This crusher is furnished by the state and every farmer who wants ground limestone may get from 10 to 70 tons. The only cost is fuel, and oil to run the tractor, and the labor. The total cost usually runs from 40 to 70 cents per ton.

The crusher will go from farm to farm and from community to community just like a wheat thrasher. After the crusher passes through a community it will not return.—*Glasgow* (Ky.) *Times.*

Department of Commerce Publications

THE 1931 EDITION of "List of Publications of the Department of Commerce" was recently issued. This pamphlet contains a complete list of available publications of the department. This annual list, as well as a monthly list of new publications by the department, are available without cost to those who may desire them. As the Bureau of Mines and the Bureau of Standards are in the Department of Commerce, publications of these bureaus are included in these lists.

Merchandising Ready-Mixed Concrete

LONG known as reliable, experienced concrete contractors, the V. E. Schevenell Construction Co., of Memphis, Tenn., is now utilizing its good reputation in the building field to merchandise ready-mixed concrete. Faith in the possibilities of this product and the ability to produce concrete of reliable, uniform quality have led this company to develop ready-mix business among architects, builders, investors and others closely associated with construction operations of various kinds.

One of the methods which this company used to introduce its new product is interesting. An attractive piece of direct-mail advertising was prepared, printed on good paper stock of a green shade, and mailed to customers, friends and other prospects. The envelope used resembled those commonly utilized for mailing Christmas, New Year's and similar greetings.

This letter or invitation, as it is properly called, describes the kind of concrete which is available from the V. E. Schevenell Construction Co. Likewise, it tells where this concrete may be used. For example this statement is made: "Schevenell's ready-mixed concrete is available for every concrete job including sidewalks, driveways, pavements, building foundations, basements, engine foundations, reinforced walls, light and heavy duty floors and wherever 'Concrete for Permanence' is sought."

Through this invitation the Schevenell organization invited interested persons to visit its new plant at 1280 Walker street, Memphis, and inspect ready-mixed concrete in the making. Architects, builders and others who accepted this invitation were enabled to follow concrete from the "factory" to the point of placing.

This invitation not only is a clever example of advertising, but it is a sincere effort on the part of the V. E. Schevenell Construction Co. to make its produce—ready-mixed concrete—better known to the building public.

Where its services are required, and its sales efforts are directed to that end, this company prefers to mix the concrete for any one certain job at the plant, transport it to the construction site and then handle the placing of it with trained workmen.

British Patent on White Cement

IN ORDER TO PRODUCE a white cement, the raw materials, immediately after the calcining process, are treated with a reducing agent (such as coal dust or paraffin oil spread on a surface on to which the hot clinker is allowed to fall), followed by immediate cooling to prevent reoxidation. This process is covered by British patent 331,584, issued to British Portland Cement Manufacturers, Inc.—*Chemical Abstracts.*

Business Men Defend Sand and Gravel Company

A STATEMENT signed by merchants of Lewisville, Ark., was received recently by Lieut. Gov. Lawrence E. Wilson of Camden, commending him for his action in remitting a fine imposed on the Meriwether Sand and Gravel Co.

With the statement was a letter from Senator Ned Stewart, which said in part: "Attached hereto is a statement signed by every business man in Lewisville, which shows you exactly their attitude with reference to the $50 fine which you remitted for the Meriwether Sand and Gravel Co.

The statement follows:

"In reference to the article which appeared on the front page of the *Arkansas Gazette* this morning (June 5) regarding a $50 fine imposed on the Meriwether Sand and Gravel Co., Inc., by Lafayette county chancery court, we want you to know we appreciate your attitude in this matter and think you did the right thing in relieving this company from payment of this fine.

"The Meriwether Sand and Gravel Co.'s payroll has been our only salvation in Lafayette county during the past few years. This company has been wilfully and maliciously prosecuted in local courts for every known charge that could possibly be brought against them, and every possible effort has been made to drive this corporation from Lafayette county.

"In attempting to comply with the injunction granted by Lafayette county chancery court, this company spent approximately $6,000. Chancellor Stevens, at the time he imposed this fine, said he did not think this company had wilfully violated the injunction, but that there probably was a technical violation, and for this technical violation, he was imposing a fine of $50."—*Little Rock* (Ark.) *Gazette.*

Ask Damages in Gravel Pit Drowning

ACTION for $20,250 damages against the Queen Anne Sand Co., Seattle, Wash., was started June 16 by Mrs. Dorothy M. Grigsby, whose son, 13, drowned May 3 in a gravel pit of the company.

The boy drowned in 16 ft. of water when he fell while playing on the bank of the pit.

The complaint charges the sand company with maintaining a gravel pit in the heart of a residence section without taking proper safeguards, in violation of a city zoning ordinance.

At the time of the tragedy, however, W. C. Bickford, president of the sand company, asserted every precaution had been taken to prevent children from playing near the pit. A barbed wire fence surrounded the excavation and "no trespassing" signs were prominently posted, he said.—*Seattle* (Wash.) *Post Intelligencer.*

New York Takes Steps to Regulate Dredging in Long Island Sound

ATTORNEY GENERAL John J. Bennett has notified the North Shore committee of the Long Island, N. Y., Chamber of Commerce that he has warned sand and gravel dredgers operating in Long Island Sound and those who have made application for permits from the Federal government for such dredging, to cease their operations.

The attorney general has called the attention of the dredgers to the fact that the land under water in Long Island Sound to the Connecticut line is the property of the state of New York and subject to its sovereignty and control and that permits for dredging issued by the Federal government do not constitute more than a mere indication that such dredging operations do not interfere with navigation. The attorney general warns the dredgers operating in the Sound, that if dredging operations are continued or started hereafter action will be taken by the state to enjoin them.

A conference is to be held at an early date with Attorney General Bennett by a special committee appointed by Lewis H. Pounds, president of the Long Island Chamber of Commerce, to consider a program of regulation for all dredging in the Sound which may be permitted in the future by the state under special conditions.—*Huntington* (N. Y.) *Times.*

Builds Sand and Gravel Dock at Ashtabula, Ohio

ESTABLISHMENT of a sand and stone dock at Ashtabula, Ohio, was announced June 18 by the Kelley Island Lime and Transport Co., Cleveland, Ohio.

The new dock will be on land at the southeast corner of the property of the Great Lakes Engineering Co. on which a lease has been taken.

The plant will be in charge of T. Jensen of Erie, Penn., who has charge of the company's business at Erie, and who will supervise both plants.

For several days the sandboat *Kelley Island* has been dredging the channel near the new dock.

Modern sand and stone handling machinery will be installed on the new dock and as soon as possible regular delivery of materials will be made.

As soon as arrangements have been made, the company will have a railroad spur running to its property. Materials for road construction, concrete work, building and other projects will be shipped to points in this district and also will be sold to Ashtabula dealers.

The work will be pushed as rapidly as possible in order that operations may commence at an early date.—*Ashtabula* (Ohio) *Star Beacon.*

New Tennessee Sand and Gravel Operation

A NEW ENTERPRISE is projected near Eva, Tenn. The Ohio River Sand and Gravel Co., Marietta, Ohio, has secured an option on the sand bar in the Tennessee river at Johnsonville for the purpose of marketing the sand and gravel on the sand bar.

The company has purchased land adjacent to the sand bar where they will erect a large plant for loading. Barges will be used by the company for this purpose.

The Nashville, Chattanooga and St. Louis railway has secured the right of way for one mile of spur track from the main line near Eva to the proposed plant. The sand and gravel company propose to equip the plant sufficiently to move out two and three trainloads of gravel and sand daily.

Work is to begin at once. The railway company has completed its survey and building operations will soon be under way.

The sand on the bar is said to be of extraordinary quality and sufficient to maintain the enterprise for several years to come. This means an investment of several hundred thousand.—*Camden* (Tenn.) *Chronicle.*

Lease Indiana Gravel Site

THE Old Fort Supply Co., Ft. Wayne, Ind., and Chauncey L. Griffith have leased lots in Elmhurst Gardens Addition to Paul C. Brudi, engaged in business as the Brudi Sand and Gravel Co., for use as a sand and gravel site.

The lease, filed with the county recorded June 19, covers a three-year period starting June 11. As rental Brudi will pay 30 c. for each yard of gravel removed. The minimum rental is to be $3,000 per year.—*Ft. Wayne* (Ind.) *News Sentinel.*

Effect of Admixture of Magnesium with Lime as Fertilizer

A REPORT BY O. K. Zikhman-Kedrov says CaO, $CaCO_3$ and two kinds of limestone, one containing 47% CaO and 23.3% MgO, the other 44.7% CaO and 25.2% MgO, were compared on podzol soils. The results showed that the Mg limestone was even slightly more effective than the pure $CaCO_3$. Another series of experiments was conducted with pure CaO, MgO, $CaCO_3$ and $MgCO_3$ alone or in combinations. Again the $MgCO_3$ showed no injurious effects, and in combination with $CaCO_3$ it stimulated the effectiveness of the latter. On some field plots the amount of lime applied was almost equal to the hydrolytic acidity, and in every case the Mg-containing limestones were very effective. It is concluded that limestones containing CaO and MgO in the ratio of 2 to 1 or even 1 to 1 are not injurious; on the contrary it might be more beneficial than pure $CaCO_3$.—*Chemical Abstracts.*

Foreign Abstracts and Patent Review

Waste Heat Saving in Production of Fused Cement. W. Marschner states that E. Schirm made the following statement in his article on kilns for fused cement (*Zement*, 1931, No. 6): "In fact the electrically heated water-wall shaft kiln has succeeded in entering the fused cement industry. But it represents by no means a satisfying solution of the kiln problem, since the current costs are too excessive everywhere in order to make electric heating economically bearable."

Marschner then states that recently a patent has been applied for by M. Platsch on a process of producing electric fused cement in a more economical manner. As in all electric fusion processes so here the electric cement fusion temperature must be maintained higher in discharging than necessary otherwise. It was discovered that this excess discharging temperature of the fusion from the kiln can be utilized to advantage when cold raw material mix is allowed to be fused in with it. It was found that bauxite and lime below 1400 deg. C. combine into fused cement when they come in contact with liquid fused cement, since the formation of fused cement is an exothermic reaction. For example, about 20% raw flour mix was added to the weighed quantities in the discharge channel by supplying the material from below by means of a spiral conveyor. The discharge represented a completely fused mass which was quickly cooled.

The binding ability and strengths of the cement were the same as if the raw flour mix were not added. Other arrangements may be used to add the raw flour mix. A saving is thus made in use of electricity by the increase in output of the kiln.—*Zement* (1931) **20**, 16, pp. 362-363.

Effect of Fineness of Cement Upon Concrete. In making tests upon concrete for determining permeability to water, Ernst Rissel observed that the permeability of the concrete to water reacts much more than its compressive strength, when varying the fineness of the cement. Employing gravel of a definite granular composition, he prepared three 20 cm. cubes each, of three cements of identical composition but of different grades of fineness; and of two cements of another identical composition but also of different grades of fineness, all mixed 1:6 by volume. The test results were as shown in the table at the bottom of the page.—*Zement* (1930), **19**, 46, pp. 1079-1080.

Modern Hydraulic Lime Plant in Tunesia. With the co-operation of a group of French financiers, a lime plant of a daily capacity of 100 tons was built 11 miles from Tunis, in Tunesia, North Africa, adjacent to the calcareous deposits of the spurs of the Bou-Kornine, at Hammam-Lif. The average analysis of the limestone deposits in per cent. is 14.60 total silica, 1.25 alumina, 1.15 iron oxide, 44.75 lime, 2.05 magnesia, no sulphuric acid, 36.10 loss on ignition, and 0.10 indeterminables. The several strata of limestone are quarried, crushed to suitable size and hauled to the kiln.

The vertical lime kilns are 14¾ ft. in diameter and about 59 ft. high to the charging platform. The shaft is about 42 ft. high above the grate. Each kiln has four dischargers, each provided with a vertical grate for draft and a horizontal grate for drawing. One man is required to draw the two kilns and two men are required to charge them.

The limestone is mixed in layers with anthracite, each kiln producing 50 tons (metric) of lime per day. The charging and discharging operations require 11 hours. The kiln capacity can be raised to as much as 70 tons, if necessary. From 95 to 100 kg. of fuel is required per ton (metric) of lime drawn.

The burned lime passes in succession to a hopper, a Clero No. 2 grinder, 2-in. sieve, mixer, concrete slaking tanks, in which it is slaked without admission of outside air to effect better slaking. After a few days scrapers deliver it to chain conveyors, from which it passes to two air separators of 10-ft. diameter, which separate the fine lime from the coarse. The fine lime passes to a silo and the coarse lime to a two-compartment tube mill about 20 ft. long and slightly over 4 ft. in diameter. The lime from the mill is delivered to the screw conveyor, which also delivers fine lime to the silos, this screw conveyor thus effecting both a mixing and conveying. Two scales and sacking machines are employed, having a capacity of 400 sacks per hour. All plant equipment is enclosed to reduce dust to a minimum. All operations are mechanical from drawing to bagging. The plant is run by two Diesel engines, a 150-hp. vertical and a 55-hp. horizontal unit, equipped with two alternators.

The "Franca" brand of lime produced in this lime plant is of the following composition and properties: Chemical analysis in per cent.: 5:25 sand, 19.29 combined silica, 3.73 alumina, 2.02 iron oxide, 60.06 lime, 0.38 magnesia, 0.40 sulphuric acid, 9.20 loss on ignition, making 100.33. The average tensile strength of pure paste is 8.1 kg. per sq. cm. after 7 days and 16.4 kg. per kg. sq. cm. after 28 days, and that of mortar 4.8 after 7 days and 9.0 kg. per sq. cm. after 28 days. The compressive strength of normal mortar is 24.0 after 7 days and 37.1 kg. per sq. cm. after 28 days. These are the properties of an excellent lime, eminently hydraulic.—*Revue des Materiaux de Construction et de Travaux* (1930) 254, pp. 425-429.

Hardening Problem of Portland Cement. Karl E. Dorsch has checked the results obtained by Tippmann (*Zement*, 1930, No. 52, p. 1225) by making tests, in which he was unable to reproduce the observations made by Tippmann; Kuehl and Czernin have verified in their experiments the results obtained by Dorsch.

Freshly precipitated calcium carbonate was heated by Dorsch for four hours at 1000 deg. C., and the obtained pure calcium oxide was pulverized as fine as cement. Two grams each (of the calcium oxide powder) were placed in a number of test tubes; some was mixed with an excess of water, some with diluted and some with saturated gypsum solutions, and suspended. Parallel tests were made with portland cement in the above solutions. The test tubes were sealed and set aside for a few days, after which microscopic examinations were started and continued for several weeks.

The microscope showed no essential difference between lime and portland cement in water, in diluted and in saturated gypsum solutions. The crystal deposits on the walls of the test tubes were mostly gypsum crystals with an occasional calcium hydroxide crystal. There were no fine needles of calcium hydroxide; the needles observed were long gypsum crystals. The preparation of calcium oxide in pure water was illuminated under the polarization microscope. The only difference between water solution and the gypsum solutions is that in the gypsum solutions the amorphous calcium hydroxide particles seem to be a little larger than in the water solution.—*Zement* (1931) **20**, 13, pp. 296-297.

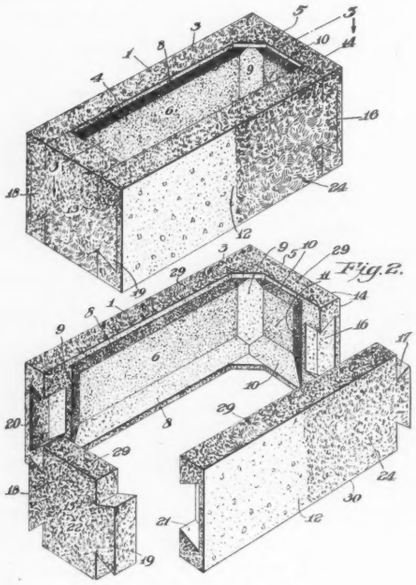
EFFECT OF CEMENT FINENESS ON CONCRETE PERMEABILITY

	Kg. cement per cu. m. ready-mixed concrete	Fineness, per cent. residue on 10,000-, 4900-, 900-mesh screens			Average compressive strength, kg./sq.cm.	Relative figure	Av. permeability to water, in cu.cm./sq.cm. per hour	Relative figure
		Cement No. 1						
Test No. 597	207	28.6	14.8	2.1	125	1	0.0500	56
Test No. 609	206	11.1	2.4	0.1	242	1.9	0.0009	1
Test No. 616	198	6.9	1.2	0.1	280	2.2	0	....
		Cement No. 2						
Test No. 608	213	17.7	5.2	0.2	100	1	0.0165	2.75
Test No. 596	207	14.1	3.8	0.1	160	1.6	0.0060	1

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

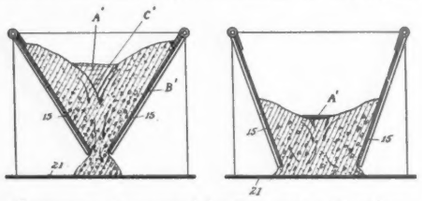
Non-Hygroscopic Plastic Building Block. As shown in the accompanying illustration, this unit is made in sections which are united with dovetailing. Inside surfaces of the block are covered with tar or some other waterproofing compound and the joints are made with cement or other binder. Arrangements are provided for



Unit is cast in sections

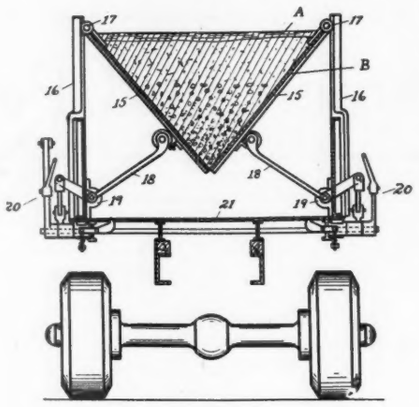
locking the blocks at the corners. The outer wall and inner wall surfaces are not treated with tar but are stuccoed or treated in any manner desired.—*John B. Linn, U. S. Patent No.* 1,780,086.

Method of Reconditioning Concrete After Transportation. The inventor says that concrete, if it is plastic enough to fill forms satisfactorily, is bound to segregate



Concrete is moved by lowering V-sides

when it is transported by truck. But he claims that, in being dumped by the truck body he has invented, the concrete may be reconditioned. The concrete is carried in a V-shaped trough in the body of the truck. The sides of the V are made of two plates which may be swung back to the sides of the truck body by two motions. When this is done slowly the concrete, it is claimed, will be spread as a fairly homogenous layer on the bottom of the truck body. Then it is dumped from the truck body in the usual way and this further mixes it, tending to render it still more uniform in composition.

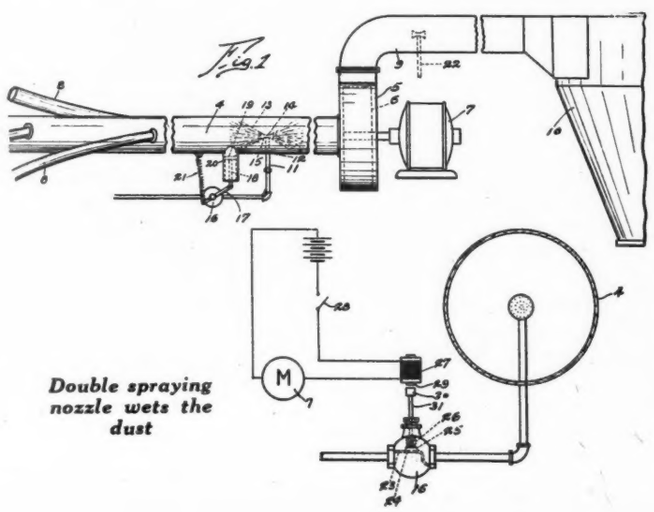


Details of mechanical equipment

—*Edward N. Jones, assignor to C. O. Bartlett and Snow Co., Cleveland Ohio, U. S. Patent No.* 1,779,708.

Recording Explosive Shocks. The invention is intended to locate and give the relative magnitude of earth shocks (such as those produced in blasting) and may be used in geophysical examinations, locating cannon or batteries and like work. The inventor says that the seismograph usually employed for such work is less sensitive and less accurate than his device. It is too complicated to describe in detail, but it works by converting the vibrations from earth shocks into electrical impulses which are then recorded by an oscillograph, or recording galvanometer. The means employed include thermionic amplifiers, piezo crystal devices, grid tubes and other things which have been introduced by radio engineers.—*Frank Rieber, U. S. Patent No.* 1,780,567.

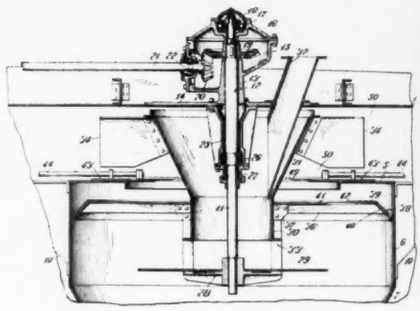
Dust Collection. The novel feature of the invention shown is the device for wetting the dust. This consists of a double spraying nozzle in the collecting pipe which is controlled by a valve that shuts off the water when the fan that makes a suction in the collecting pipe is not working. The means for doing this is a piston in a cylinder that is drawn inwardly when the fan is working. When the fan stops a spring on the other end of the valve lever pulls the piston back. This also moves the valve lever to shut off the water.—*S. W. Kirk, assignor to Kirk and Blum Manufacturing Co., Cincinnati, Ohio, U. S. Patent No.* 1,792,590.



Double spraying nozzle wets the dust

Cement Waterproofing Solution. A composition which the inventor says will waterproof cement concrete, increase its durability and rejuvenate it by covering stains and discolorations consists of: Sodium carbonate, 9 parts; aluminum sulphate, 1 part; potassium permanganate, 1/32 part; water, substantially 20 parts, together with sufficient pure cement to leave the composition fluid whereby it may be applied as a liquid coating composition. He says that this may be painted, sprayed, swabbed or otherwise applied to floors and walls.—*Sam C. Bennet, U. S. Patent No.* 1,791,704.

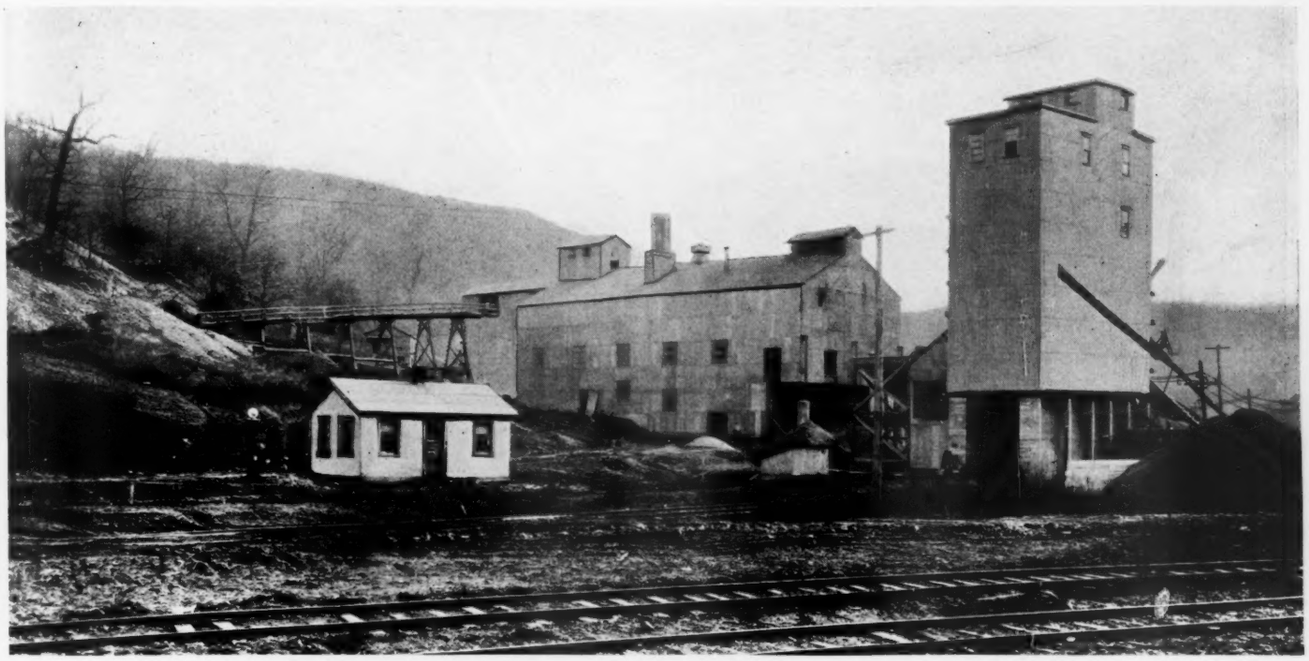
Mechanical Separator. Described by its inventor as a mechanical separator, it has all the elements of the ordinary air separator plus an extra device that he calls a "whizzer." This is a series of thin blades (one is marked No. 36 in the illustration) which project from the revolving hopper into the separating chamber. As in other separators, the air current set up by suction from the fan (No. 34) is drawn up through the separating chamber. In this machine material cannot pass out to the fan without passing between the blades of the whizzer and any particles that may not have fallen by gravity will be struck by the blades of the whizzer and thrown against the wall of the separating chamber. Only the finest particles will be carried by the air stream through these swiftly revolving blades and go into the fines, according to the patent specifications. The flow of air can also be regulated by varying the size of the opening at the top of the separating chamber.—*Walter M. Cook, assignor to International Combustion Engineering Corp., U. S. Patent, No.* 1,783,357.



"Whizzer" is novel feature

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE



General view of plant for manufacture of Haydite near Pittsburgh, Penn.

Burned Shale Aggregate in the Pittsburgh District

Details of the Haydite Co. Plant at Large, Penn.

By H. Herbert Hughes

BURNED SHALE AGGREGATE is distinctly a product of the Middle West, but steady eastward expansion has extended its use into the Pittsburgh, Penn., district.

The first large-scale utilization of concrete made with burned shale aggregate was for the construction of ships during the World War. The practical value of concrete ships may be a debatable question, but the indisputable fact remains that the concrete used in them is still sound after being exposed to sea water since 1918. This material was the forerunner of present-day "Haydite," a patented burned shale aggregate now in commercial production.

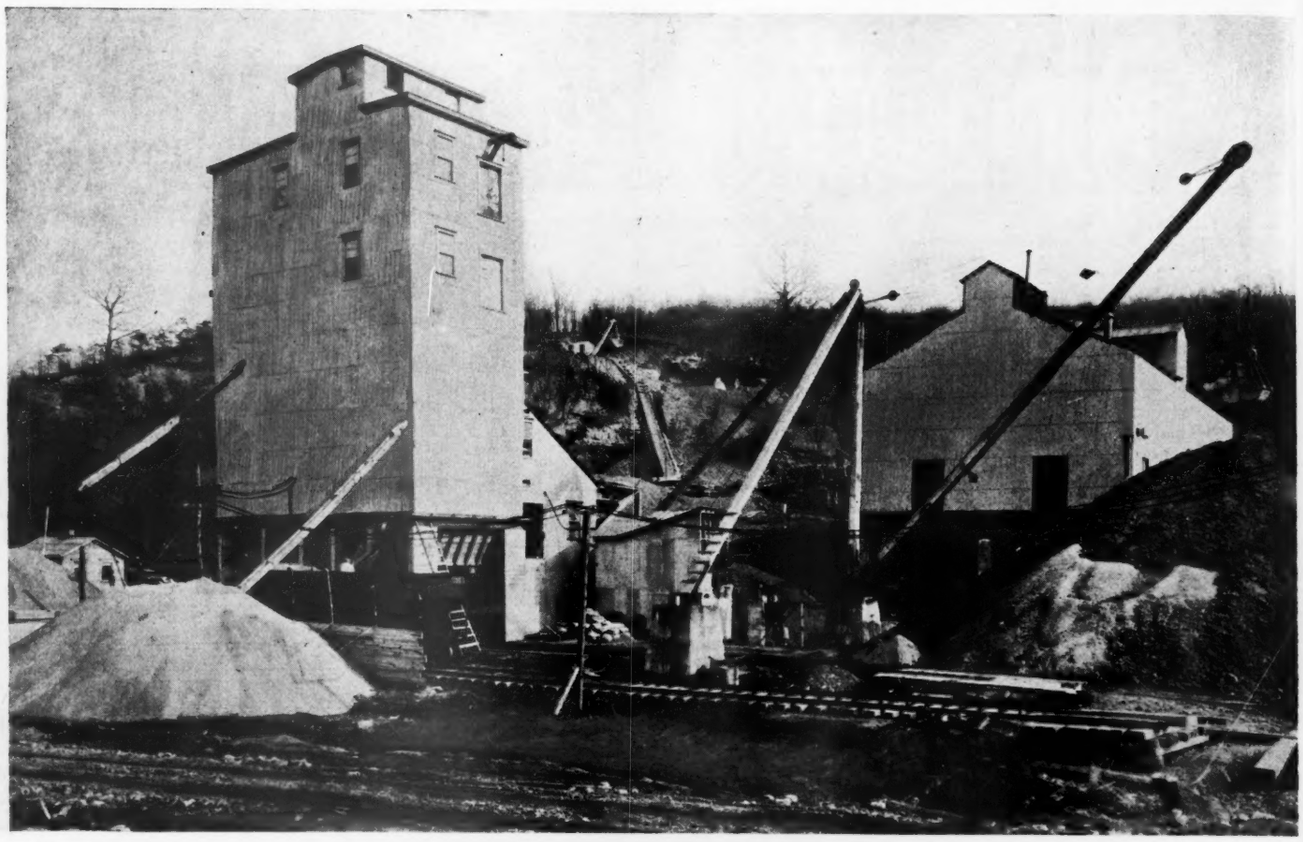
Haydite was patented and first manufactured by the late Stephen J. Hayde, whose name is perpetuated by the product which he conceived. Expansion of production has been handicapped by patent litigation, which finally has been settled. The aggregate now is being manufactured by five licensees operating eight plants in the United States and Canada.

The Pittsburgh plant of the Haydite Co., although newer than any of the others, is typical of all the plants. It is located in southern Allegheny county, at Large, about 13 miles from downtown Pittsburgh, on Pennsylvania State Highway No. 51, the principal connecting link between Pittsburgh and Uniontown. The plant is served by the West Side belt branch of the Pittsburgh and West Virginia railway, which connects with the Pittsburgh and Lake Erie at Pittsburgh and the Pennsylvania and Union railroads at Clairton. The Monongahela river is only about two miles from the plant, but as yet no attempt has been made to utilize its water transportation facilities.

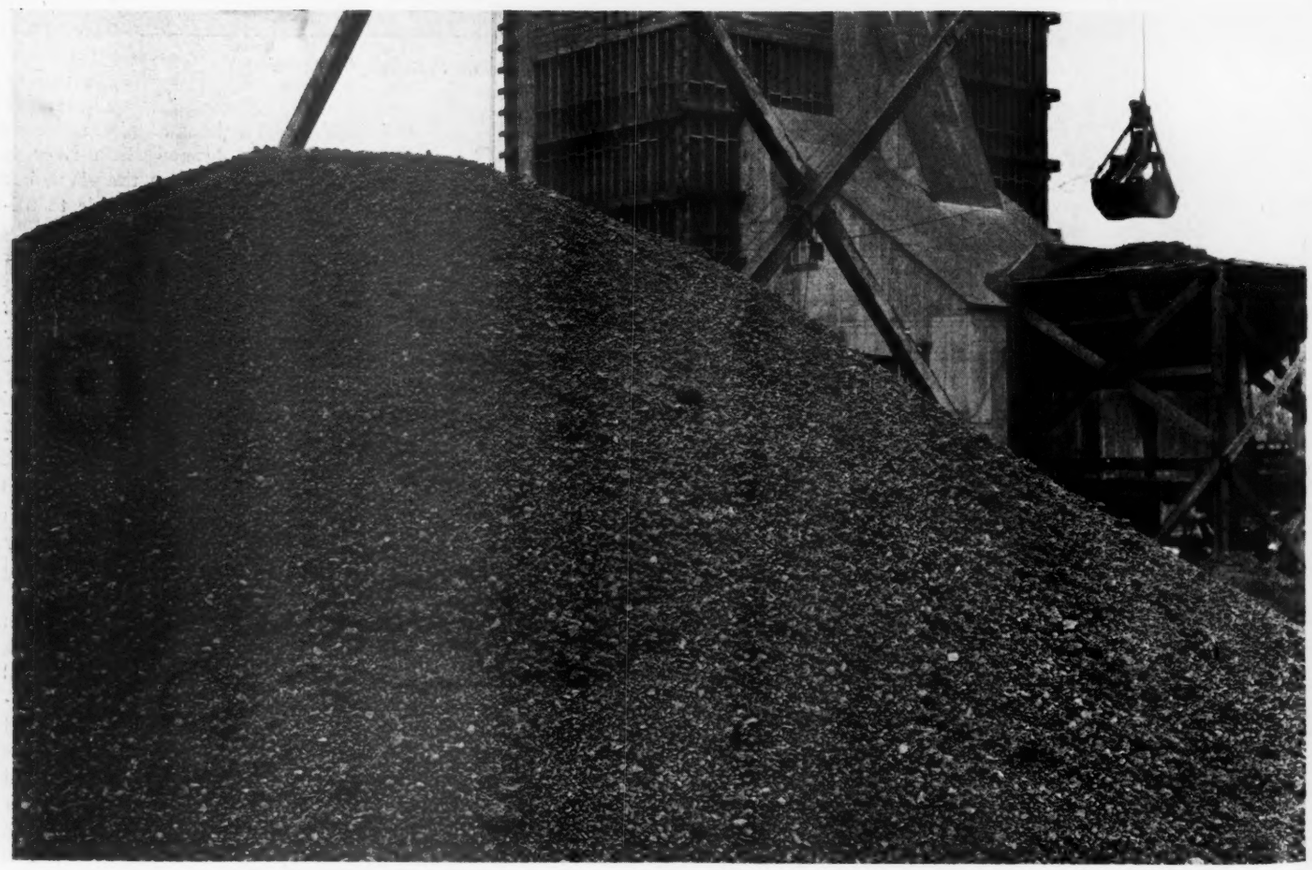
Raw Material

The raw shale used at present is dug from the hillside directly behind the plant. It is essentially a mixture of partially weathered shale and alluvial clay, grading to unaltered clay shale at the bottom of the pit. This shale belongs, geologically, to the upper part of the Conemaugh group of rocks. It lies about 150 ft. below the Pittsburgh coal bed, which is mined on the other side of the valley at mine No. 7 of the Pittsburgh Terminal Coal Co.

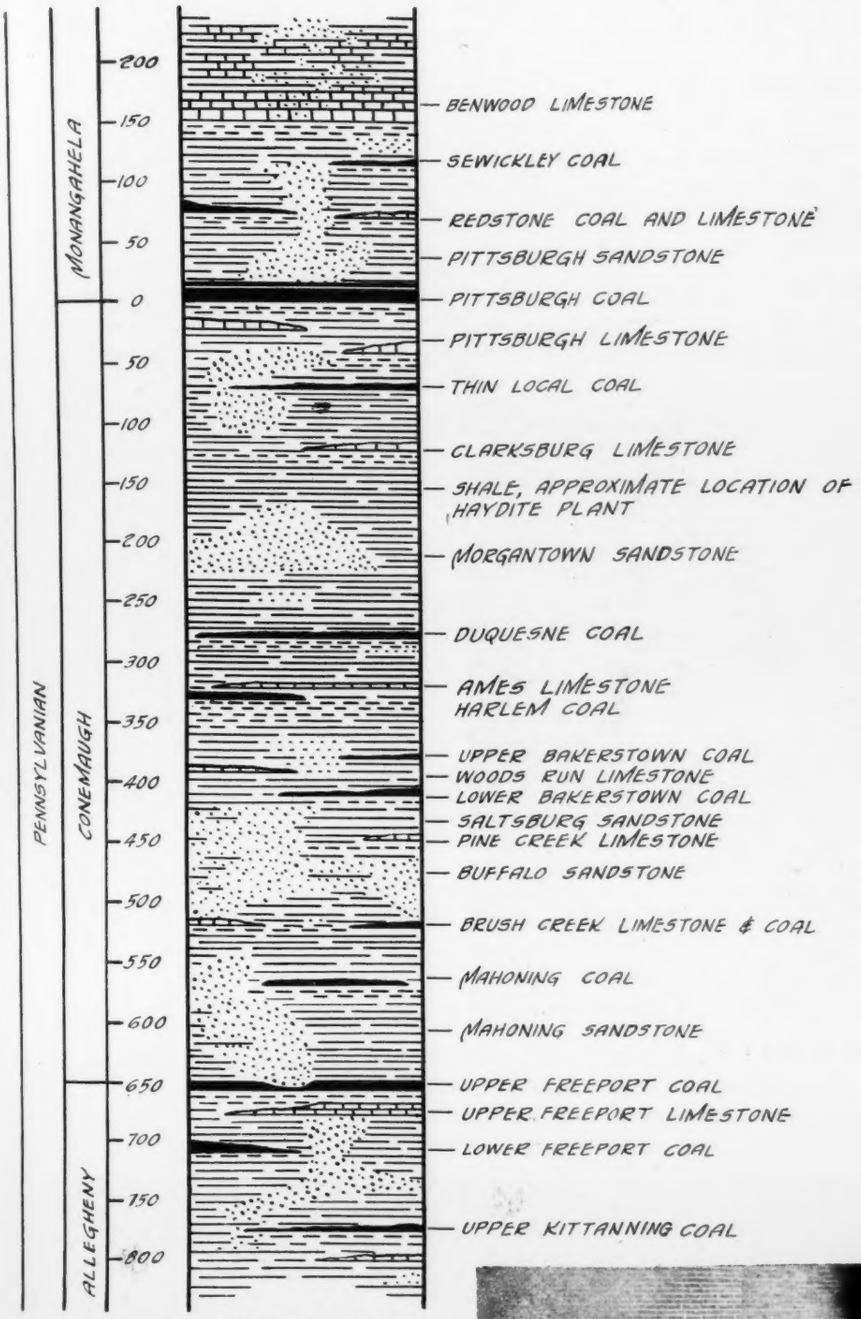
Of the shale and clay which has been used at the plant it has been found that a blue clay similar in nature to residual blue plastic clay will make the best Haydite from the standpoint of both weight and strength. Most of the hillside above the present pit consists of beds of red shale which is characteristic of the upper Conemaugh group. This red shale makes good quality Haydite, but the weight of the product is slightly more than that



Crushing and screening plant



Closeup of Haydite clinker pile. Rotary crusher is fed from hopper at right



Generalized geologic column in Allegheny County, Penn.

now being made. Experiments have shown, however, that by varying the burning practice a satisfactory aggregate can be made from this material.

The shale is quarried at present by ordinary open-pit methods. A belt conveyor carries the raw material from the cars to the dry pan. A standard 9-ft. dry pan, manufactured by the United Iron Works Co., crushes the material to pass a 1½-in. screen. In other plants the maximum size varies from 1 to 2 in.

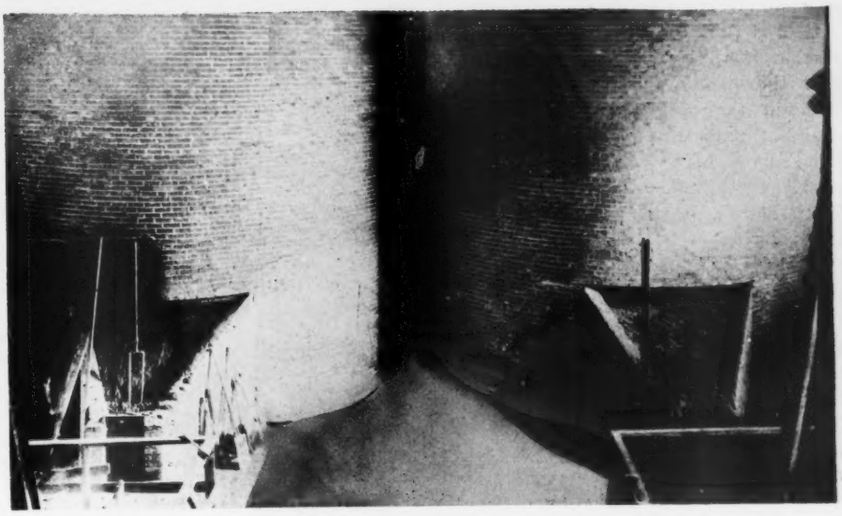
Plant Processing

The crushed material is carried by elevators to the raw shale storage which is provided by two cylindrical reinforced brick bins, each 19 ft. in diameter and 32 ft. high. The total capacity of these bins is 600 tons, enough to run the plant at its maximum output for nearly five days if shale production should be discontinued temporarily because of inclement weather, repairs to equipment, or similar causes.

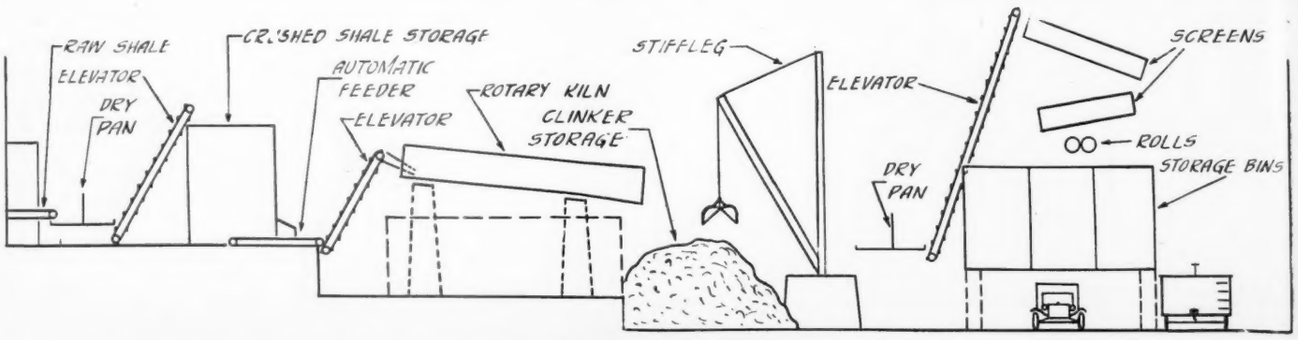
The volume of crushed shale fed from the bins to the elevators which carry it to the charging ends of the bins is governed by an automatic feeder. The rate is controlled by the speed of the kiln into which the shale is being charged. The speed of rotation of the kiln, in turn, is accurately checked by an automatic counter. In normal practice 2½ ft. of shale is fed off the conveyor into the kiln for each revolution. The speed of rotation varies with the material being burned, but the average is from 40 to 44 revolutions an hour. Each kiln is driven by a General Electric 10-hp. variable-speed motor; therefore the rotation of the kiln can be regulated to conform with the nature of the shale.

Each plant unit is designed with two identical rotary kilns manufactured by the Hardinge Co., York, Penn. Provision has ben made at the Pittsburgh plant for the erection of additional units directly alongside of the present one. The kilns are 6 ft. in diameter by 50 ft. long. The last 10 ft. of the discharge end of each kiln is slightly bell-shaped, expanding to a maximum diameter of 7 ft.

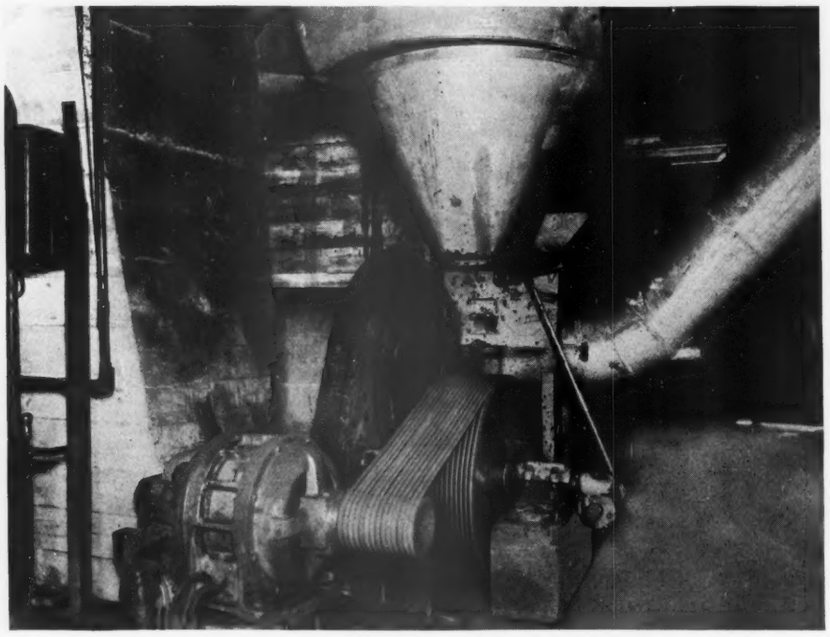
The temperature at the charging end is approximately 600 deg. F. This preheating partially vitrifies the exterior of each shale fragment, thereby preventing the gradual escape of gases formed within it during the burning process. About 10 ft. from the discharge end of the kiln the temperature is raised to 2000-2500 deg. F. This sudden increase causes semifusion of the material, and the escaping pent-up gases expand each shale particle into a



Bins from which the raw shale is drawn



Simplified flow sheet of Haydite plant



Coal mill and distributing pipes

vesicular clinker. The average actual burning time is only about 15 minutes, but the total time required for the charge to pass through a kiln is from 40 to 45 minutes.

Each kiln is lined throughout with Harbison-Walker fire brick. Lifts are installed in the lining to within 13 ft. of the discharge end. These lifts, which tend to mix thoroughly the shale as it passes through the kiln, are standard precast Haydite units made with a 1:6:6 mix. They have been in continuous use for nearly a year and a half and their durability should be adequate proof of the fire-resisting properties of Haydite units.

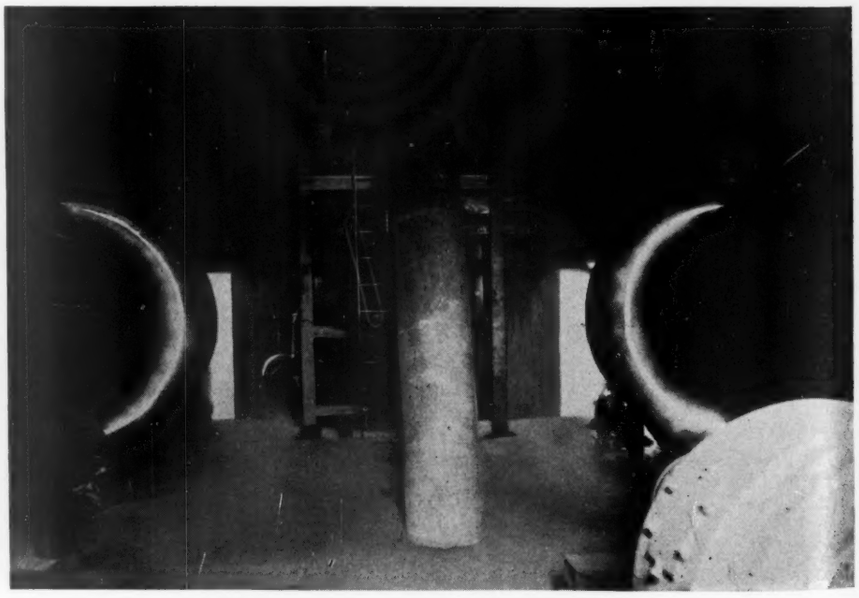
Pittsburgh slack coal bought on the open market is used for fuel. Slack not only is cheaper than run of mine but also costs less for grinding. It is crushed in a dry pan to ½-in. maximum and then in a Bonnot ball mill until 90% passes 200-mesh. The powdered coal is fired through automatic feeders, two jets of flame being directed on the shale about 5 and 10 ft., respectively, from the discharge end. A Jones and Hartman waste-heat coal dryer attached about midway around each kiln increases fuel efficiency.

The design of the plant allows ample space for clinker storage under the discharge ends of the kilns. The hot clinker drops direct from the kiln to the stockpile. A stiff-leg is used twice a day to move the material which has accumulated. It is allowed to cool thoroughly, being wet down just before grinding. Haydite clinker may lie in storage indefinitely without any deterioration.

Crushing and Screening

Preliminary crushing is with a 9-ft. dry pan identical to the one used to crush the raw shale. The maximum size to which it is crushed depends upon the grade of Haydite which is to be produced on that particular run. Three standard sizes are marketed. The coarse grade is composed of ¾-in. to 4-mesh particles; the intermediate, ½-in. to 4-mesh, and the sand size, 17% retained on 14-mesh down to about 10% passing 100-mesh. Their fineness moduli are 6.70, 6.20 and 2.65, respectively. Ordinary smooth rolls are used for grinding to the fine sizes.

The screens are most interesting. They may be called the "Ballou type," having been devised by the late B. W. Ballou, president of the Haydite Co. They are



Looking toward firing end of rotary kilns

McCann store building, Pittsburgh, Penn., using more than 100,000 Haydite building units

Allegheny General Hospital, using Haydite concrete roofs

built in semi-cylindrical sections 2 ft. long, several sections being joined together for each screening operation. Preliminary screening at the Large plant is over a 12-ft. screen composed of six individual sections. The screen used for finer grading is only 8 ft. long. The operation of these screens is unique. The screen proper is a stationary, slightly inclined trough down through which the crushed Haydite passes. A series of revolving paddles similar to those of the stern-wheelers of bygone river days forces the material through the openings. Practically every commercial screen has been used for Haydite sizing, but this type is the only one which has given satisfactory results. The screen cannot be patented because the principle has been known for many years, although Haydite seems to be the first product for which it has been used efficiently.

Commercial Sizes

The material is stored in bins according to the three commercial sizes. Segregation is practically overcome in the bins from which trucks are loaded by feeding the aggregate through a screen at the bottom of each bin rather than through a single opening. Modifications of this principle are adaptable to other storage facilities both for Haydite and for similar materials.

The plant is entirely electrically equipped, power being supplied by the West Penn Power Co. Thirteen General Electric motors with a total of 303½ hp. are used throughout the plant, but the loads are periodic. The average 24-hour requirement is only about 100 hp. per hr.

The daily output of the plant when both kilns are in operation is about 240 cu. yd. The design of the plant, however, permits wide flexibility of operation. Either kiln can be operated independently of the other. This feature is desirable because production can be readily regulated to conform with the immediate demand. The crushing equipment is adequate to handle a much larger tonnage than the maximum output of the present plant, therefore an additional unit may be added without any change in crushing practice.

Sixteen men are employed when the plant is operating full capacity and, judging from the way in which Haydite has been received in the Pittsburgh district, the plant apparently will need to operate on a full schedule in order to meet the demand.

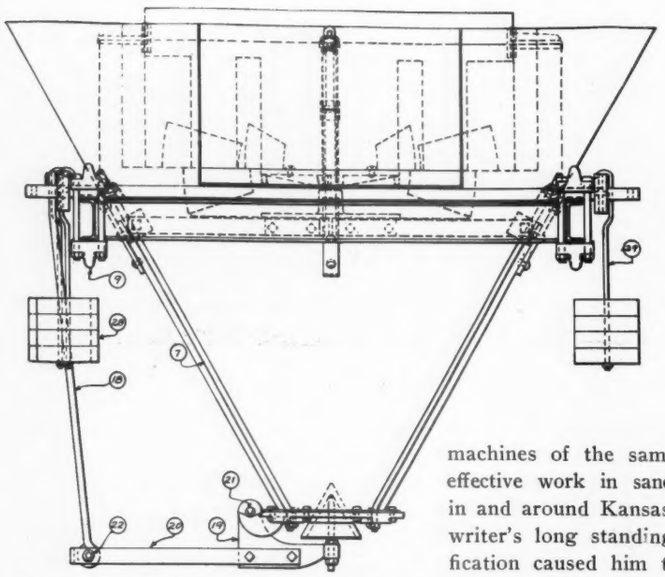
Wyeth C. Walters is sales manager for the Pittsburgh district. Mr. Walters had several years experience with the Haydite Co. in Kansas City and St. Louis before the Pittsburgh plant was built, and he has been in Pittsburgh since its construction was first started. The plant superintendent is C. L. Livingston, who has been in practical ceramic work for several years. The entire plant was designed and its construction was supervised by B. W. Ballou, president of the Haydite Co. Mr. Ballou, who died April 21, was also vice-president of the American Aggregate Co., which controls the patent rights on the manufacture of Haydite. He had been connected with Haydite since its earliest introduction to the public and, in association with the late Stephen J. Hayde, was most instrumental in its commercial development.

Haydite, although available in Pittsburgh markets for only a little more than a year, has been used in several well-known buildings. Aggregate for structural concrete is sold direct to the contractor, either f.o.b. Large, or delivered to the job. About 50% of the production is consumed by concrete products manufacturers, principally those in western Pennsylvania, although a plant at Media, Penn., and one at Baltimore, Md., are served from Large.

Approximately 100,000 Haydite concrete units were used for backup of exterior brick and terra cotta, for partitions and for column fireproofing in the McCann store building in Pittsburgh. Similar units were used for backup in the Church of the Assumption at Bellevue. Haydite concrete is now being used in the Allegheny General Hospital and the Cathedral of Learning of the University of Pittsburgh. The floor of the bridge over the Monongahela at Point Marion is light-weight concrete made with Haydite aggregate. The new high school at Washington, Penn., is a fine example of the possibilities of Haydite in school construction. The excellent fireproofing qualities and other desirable properties of Haydite concrete and precast units have led to their specification in several other schools, residences and numerous miscellaneous structures.

One of the principal outlets at present for Haydite from the Pittsburgh plant is the Federal-American Cement Tile Co., which is one of the largest manufacturers of precast roofing slabs in the United States. Haydite aggregate is used exclusively in the light-weight slabs made by this company at Wampum, Penn., Lincoln, N. J., Birmingham, Ala., and Chicago, Ill. The first three of these plants are supplied from Pittsburgh.

The reception given to Haydite in the Pittsburgh district since its introduction a year and a half ago indicates that the future of this product is assured.



Fins and rabbles on revolving cylinder are shown in dotted lines

New Classifier for Sand

Invented by Charles E. Wood, Baxter Springs, Kan.

Described by Edmund Shaw
Contributing Editor, Rock Products

A NEW CLASSIFIER is ordinarily nothing to be excited about, for there are many forms in existence and more are being thought up daily in the mills and plants where they can be used. But most of these new devices differ from those already in use only in details. Often these differences are important from an operating point of view. But they do not affect the *fundamentals* of classification, and the inventions and improvements that do affect them are very few.

A classifier which really has applied the principles of classification in a new way was exhibited at the annual convention of the National Sand and Gravel Association this year, where it attracted a great deal of attention. The laboratory model shown did excellent work, and the inventor, Charles E. Wood, of Baxter Springs, Kan., was able to show that commercial machines of the same kind were doing effective work in sand and gravel plants in and around Kansas City. The present writer's long standing interest in classification caused him to study the device rather carefully and to write to the inventor and others for data of operation. The study leaves no doubt in his mind that the device employs a method that is quite new in classifying devices and that it will work as well on a large scale as on a small scale. Also the device has a number of ingenious features that add to its value as an operating device.

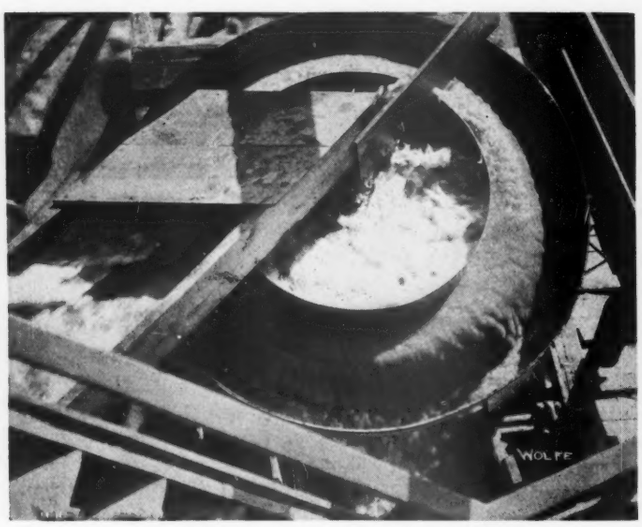
Self-Created Current

The name, "Auto-Vortex," suggests that it uses a vortex current that it creates itself, and this is a fairly good description of its method. There is a cylinder in the main cone that has vanes on the inside, and it is mounted so that it can revolve horizontally. The feed stream is turned into this so that it strikes the vanes and this carries the cylinder around. There is an old-fashioned horizontal water wheel like it that was sometimes used on the grist mills built a century or so ago.

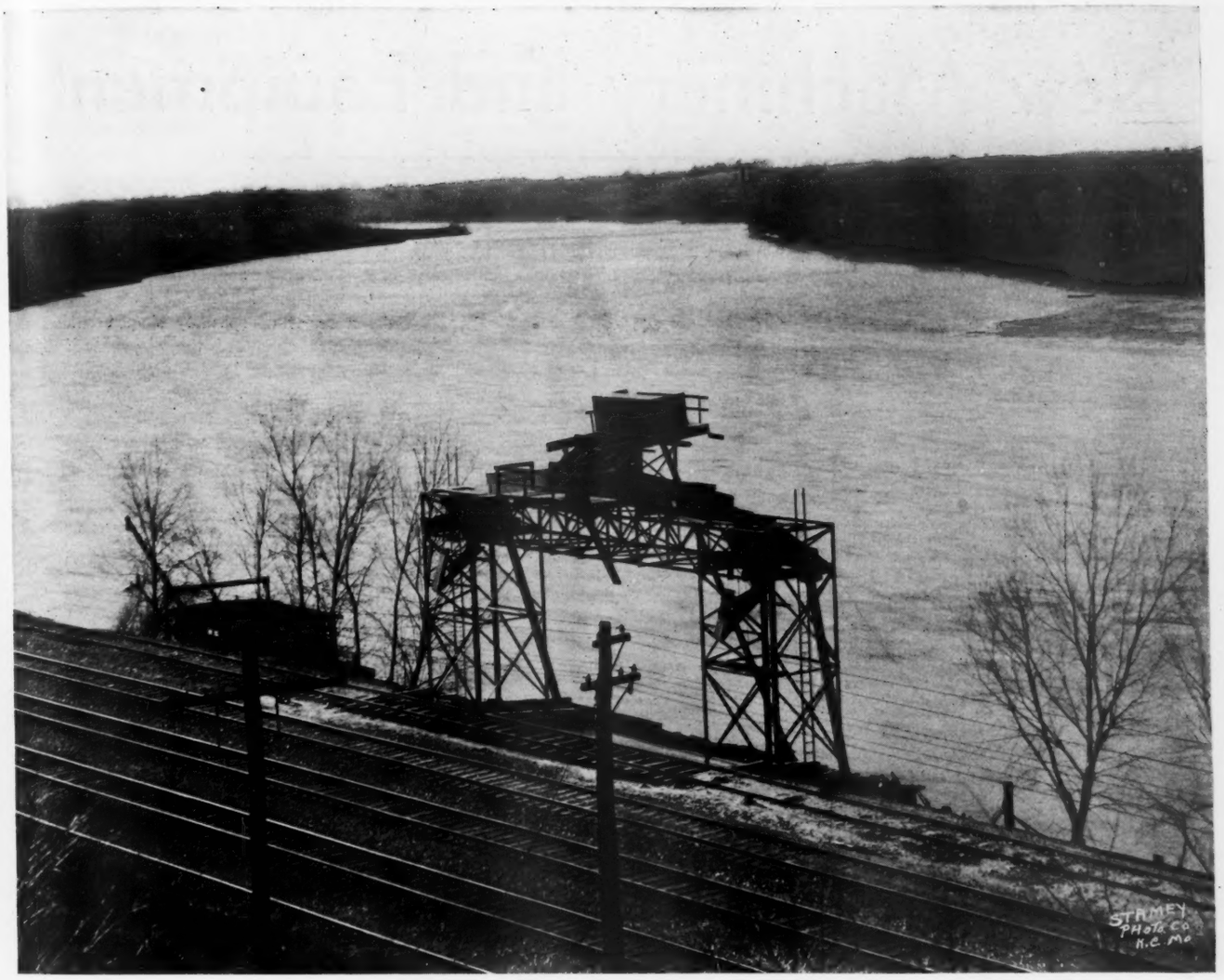
The feed goes out of ports in the bottom of the cylinder, which distributes it evenly all around. The discharge method is such that a sand bed is held close to the bottom of the revolving cylinder and the motion in this narrow space between the cylinder and the sand bed gives a scrubbing action. The scrubbing is helped by rabbles or flat rakes carried on the cylinder.

After passing out of the bottom of the cylinder the current rises to the overflow, carrying with it the fine sand and light trash and clay that it is desired to wash away. The space through which it rises has the revolving cylinder on one side and a stationary ring (called the expanding ring) on the other. Of course, as it rises it continues to whirl from the motion given it by the revolving cylinder, and this is really the new feature of the invention.

Whirling currents have been used before. Richards patented a classifier using them about 20 years ago. But his device and all the others of which the writer knows used a whirl that was set up by shooting in a tangential current. The whirling air current in the "cyclone" dust collector that is used to catch dust and



Looking down on the classifier in action



An installation of the new type of sand classifier

shavings is made that way. The trouble with it for a classifier current is that it is hollow in the center and anything that gets in toward the center will fall. I know, because I have tried this experimentally.

Mr. Wood found this out, and he says in a personal letter: "I ran into the difficulty of the centrifugal force forming a narrow sheet on the outer wall of the column, while the sand tended to descend through the center of the column. I started placing a core in this vortex and increasing its size until I forced the sand into the revolving water of the vortex. Then I found I had created a trap, unless I could get a perfect balance of the uprising velocity in the throat of the vortex and throughout the sorting column. . . . Sand would accumulate to where it would overbalance the force of the vortex and then choke the machine down. From then on I worked toward introducing the water on the inside of the vortex. This produces a reasonably high efficiency without danger of choking."

He built a number of machines of glass and pyralin so that he could study the currents. He says of this study:

"The one point that was brought forcibly to my attention was my inability to baffle water currents without setting up currents or eddies which were detrimental to the efficiency desired. The solution which suggested itself was the creation of *one big forceful eddy* which would prevent the formation of other currents."

Whenever it is necessary, clear water can be used to displace the dirty water that comes with the feed, and the current of clear water is given a whirling motion, too. But Mr. Wood says that he has not often found clear water addition to be necessary, even where lignite and trash are to be removed.

Method of Discharge

The method of discharging the settled sand is by the weight of the sand causing the cone to sink and causing a valve on an arm to sink farther to make an opening. The valve is one of the most ingenious features of the device. It is a cone set on a spindle so that it can tip freely. When a stone or other large piece comes along the cone merely tips to one side and lets it pass. The expanding ring already mentioned is another important feature. By making it larger or smaller the space in which the whirling current rises to the overflow is increased and this controls the classification.

Definite Modulus Maintained

The reports of the work of the classifier that I have received do not give screen analyses and quantities. The users seem to be satisfied so long as a definite fineness modulus is maintained, because the fineness modulus is an important part of the state highway specification for sand in Kansas, where these machines are operating.

The machines are making a number of products, from "sand-gravel" (a very coarse sand) to engine sand. They are said to remove trash and lignite satisfactorily.

New Machinery and Equipment

New Small Bucket Loader

A NEW SMALL bucket loader that will operate inside a box car and that will handle material such as bulk cement, silica,

Handles bulk materials not over 4-in.

and other bulk materials not exceeding 4 in., from box cars, at the rate of ½ cu. yd. per minute has been placed on the market by the Barber-Greene Co., Aurora, Ill.

The loader is wheel-mounted and self-feeding. It is powered by a 5-hp., 1800-r.p.m., ball-bearing motor. The motor is totally enclosed in the machine, and fan-cooled.

Material is fed into the buckets of the Model 63 by a spiral ribbon type feeder. The diameter of the ribbon is 24 in. and the machine makes a cut 4 ft. wide. Special welded steel buckets, 10 in. x 4¾ in. x 6 in., spaced 8 in. apart on a combination steel and malleable iron chain are used. The whole bucket line is housed to create a minimum of dust.

For loading wheelbarrows or buggies, a canvas chute is hung from the discharge end, conveying material directly downward from the discharge end without creating dust, it is said.

When in working position the new loader is 7 ft. high, 6 ft. 9 in. long, and 4 ft. wide.

Oil-Type Air Cleaner

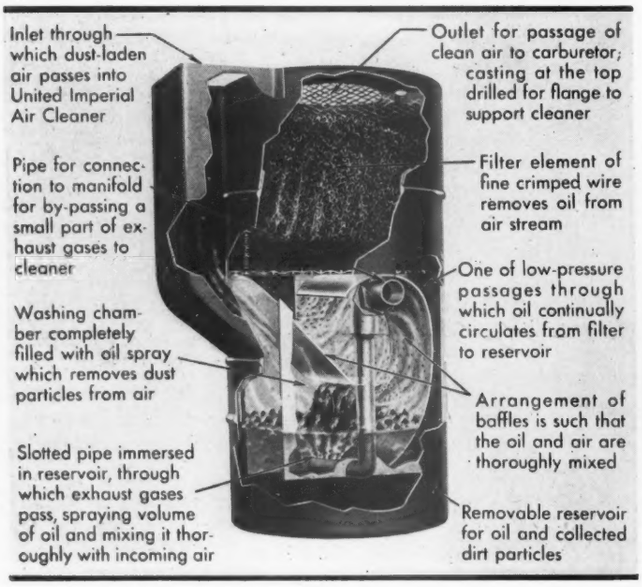
UTILIZATION of exhaust gases as a means of operation is a new feature incorporated in the United Imperial air cleaner recently developed by the United Air Cleaner Corp., Chicago, Ill., and designed for the protection of internal-combustion engines used on tractors, trucks, excavators, compressors and other engine-driven equipment exposed to severe dust and dirt conditions.

As shown by the accompanying illustration, the new cleaner is of the oil type. It is said that as soon as the engine is started, the heated gases emitted through the slot cause turbulence in the oil, with the result that the washing chamber immediately above the reservoir is completely filled with an oil spray. Outside air admitted to this chamber must pass through the spray and be deflected by a series of specially shaped baffles, the combined action of the oil spray and the baffles resulting in thoroughly washing the air and removing the dust particles. The oil-laden air then passes through a filter compartment packed with fine crimped wire, which removes the oil and completes the cleaning process.

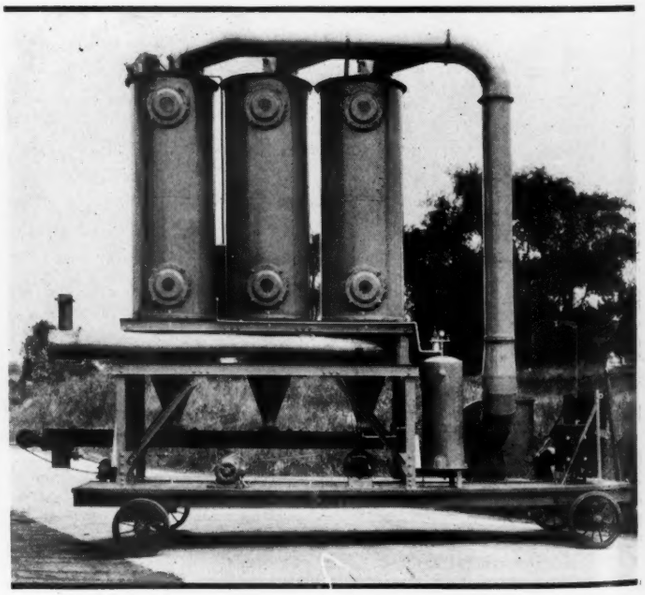
Portable Dust-Collecting Equipment

A SELF-CONTAINED portable dust collector was recently designed by the Dust Recovering and Conveying Co., Cleveland, Ohio, for the use of organizations desiring to study dust and fume problems at a number of different points in a plant.

The equipment consists of a standard 3-compartment "Dracco" filter through which the dust laden gas or air is drawn by means of the intake manifold. This manifold is equipped with a short vertical pipe to admit atmospheric air for cooling purposes. The cleaned air is exhausted through the outlet manifold and fan and it is said the solids are retained on the inside of the fabric tubes. They are precipitated regularly by the filter cleaning mechanism and are discharged below through the screw conveyor system.


Inlet through which dust-laden air passes into United Imperial Air Cleaner
Pipe for connection to manifold for by-passing a small part of exhaust gases to cleaner
Washing chamber completely filled with oil spray which removes dust particles from air
Slotted pipe immersed in reservoir, through which exhaust gases pass, spraying volume of oil and mixing it thoroughly with incoming air
Outlet for passage of clean air to carburetor; casting at the top drilled for flange to support cleaner
Filter element of fine crimped wire removes oil from air stream
One of low-pressure passages through which oil continually circulates from filter to reservoir
Arrangement of baffles is such that the oil and air are thoroughly mixed
Removable reservoir for oil and collected dirt particles

Air cleaner for internal combustion engines



Portable equipment aids dust elimination study

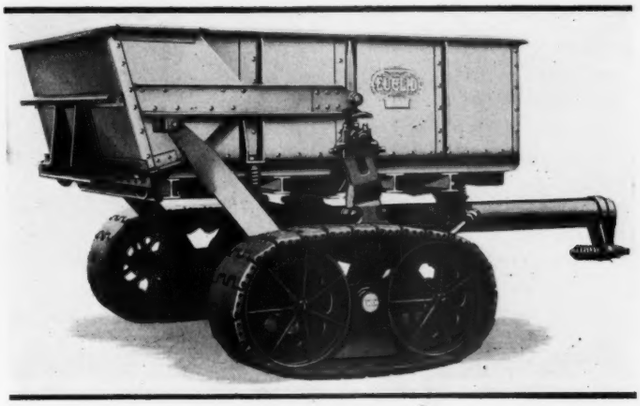
The manufacturer states that part of the value of this dust collector is that it is constructed of standard equipment and the results obtained can be relied upon for accuracy, since a permanent installation would virtually consist of this same equipment on a larger scale.

Eight-Yard Crawler Type Dump Wagon

A HEAVY DUTY wagon which can be used in mountain road construction or on high fills is announced by the Euclid Crane and Hoist Co., Cleveland, Ohio.

The body is constructed of special analysis steel. A carbon steel reinforcing plate is placed on the bottom of the body.

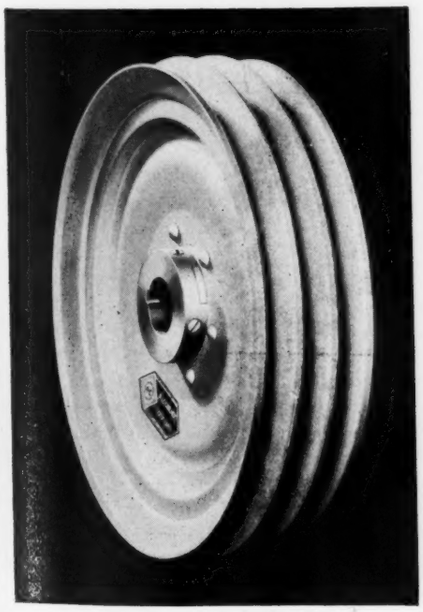
According to the manufacturer, this wagon is under the complete control of the tractor driver from his seat on the tractor. The wagon unloads itself by gravity and when empty falls automatically into loading position. The manufacturer also says it can be used as a bulldozer as well. It is mounted on the Euclid 15-ton "Track-Wheel" assembly.



Gravity rear end dump wagon on crawlers

Light Weight Sheaves

A NEW TYPE of pressed steel Texrope sheave to meet the demand for a light weight, low priced drive, has been developed by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis. "Texsteel" sheaves are die pressed from steel and then each section is welded both at the web and at the rim to eliminate vibration and noise and to give an accurate balance for true running. They are manufactured in a large range of diameters, permitting ratios as high as 6:1. They are painted with aluminum paint.



Die pressed and welded sheave

New Enclosed Transmission

THE NEW ENCLOSED design variable speed transmission, recently announced by Reeves Pulley Co., Columbus, Ind., is said to embody radical improvements over previous Reeves enclosed designs. In the new unit the standard internal operating parts of the Reeves transmission are totally enclosed in a cast-iron case to afford protection in all applications where the transmission must be guarded from water, live steam, chemical fumes or abrasives. Access to the internal operating parts is provided by U-shaped recesses in the sides of the bottom section of the case.

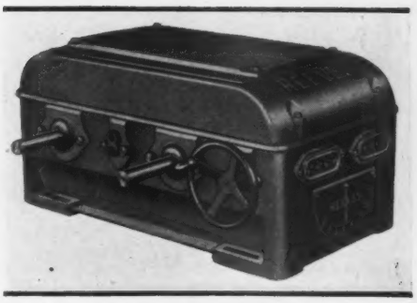
Removal of the lid permits minor adjustments, inspection parts or installation of a new V-belt.

It is said that after the transmission is in service lubrication is necessary only once in every 30 to 45 days, depending upon the type of service.

The new Reeves is built in six sizes, covering requirements from fractional to 10 hp. in all speed ranges, and can be mounted on floor, ceiling or in vertical position.

Lubrication of all bearings is accomplished through force feed fittings, located in two recessed panels at one end of the transmission. From these rigid copper tubes lead to radial shaft bearings and flexible copper tubes lead to thrust bearings fitting around the disc hubs. By means of openings from the thrust bearings the lubricant is also forced into the spiral grooves of the disc hub bores, thus lubricating the disc hubs, shafts and driving keys.

The cover section accommodates adjustable motor rails and cross rails on which a complete motor unit or auxiliary countershaft unit may be mounted.



Transmission cover may serve as motor base

Portable Testing Kit

A NEW PORTABLE testing kit for alternating current, for checking current and voltage in industrial plants and for central station use, has been announced by the General Electric Co., Schenectady, N. Y.

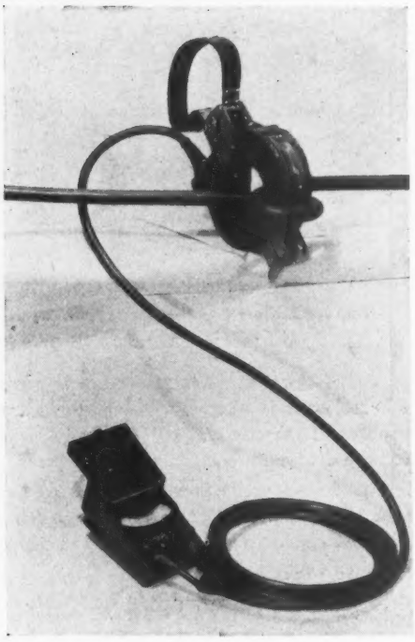
It is claimed with this kit there is no need to disconnect leads or open the circuit under test.

The testing kit includes a new split-core current transformer, a companion ammeter, another portable instrument, a 10-ft. two-circuit lead, and a leather carrying case. The transformer, ammeter and lead form a unit and are calibrated together. Testing kits of various combinations can be made up to suit individual requirements, and a 50-ft., two-circuit, calibrated lead can also be supplied.

Opening with a flick of the thumb, the new transformer snaps tightly closed, encircling the line wire. The ammeter is of the AS-3 type. Other instruments of the same type, single- and double-rated ammeters and single-, double- and triple-rated voltmeters, are available. The carrying cases, of heavy black Scotch-grain leather, are of three sizes to fit different combinations of instruments.

In describing the use of this kit the manufacturer says one method is to have one turn

Alternating current and voltage testing equipment



An application of testing equipment

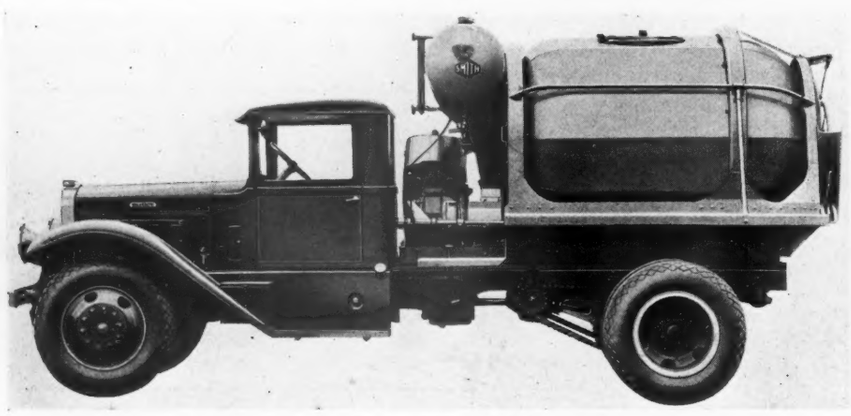
of the line through the transformer. The ammeter then indicates directly on the scale the actual current in the line. When it is desired to measure current lower than could normally be read directly on the scale, there are two turns through the transformer. The ammeter then indicates double the current in the line. This method can be carried further by increasing the number of turns through transformer, obtaining actual current by dividing readings by number of turns.

Truck Mixer Announced

THE NATIONAL Equipment Corp., Milwaukee, Wis., announces the Smith truck mixer and agitator.

This unit is said to have the following features: (1) A five-step mixing action, accomplished by clockwise rotating and without reversing direction; (2) egg-shaped drum with 12-sided panel design; (3) full control of positive discharge; (4) adaptable to any make of truck of sufficient capacity; (5) separate power unit, and (6) roller and ball bearing drum support.

This machine is offered in two sizes. The 1-1½ cu. yd. unit has a capacity of 1 cu. yd. of resultant concrete as a mixer and 1½ cu. yd. as an agitator. The 2-3 cu. yd. mixer has a capacity in resultant concrete of 2½ cu. yd. and 3 cu. yd. as an agitator. The manufacturer states a third size, with a capacity up to 4½ cu. yd. of concrete, will also soon be available.

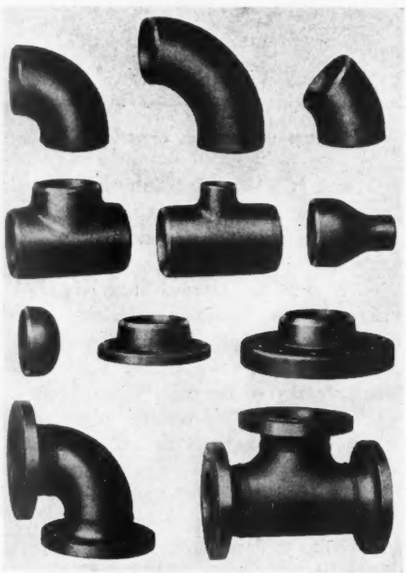


Separate power unit is used for mixing

New Pipe Fittings for Welding

THE Taylor Forge and Pipe Works, Chicago, Ill., has developed a complete line of seamless steel pipe fittings for welding. The manufacturer says all sizes to 24 in. inclusive will be ready for distribution soon, but at present only sizes 12 in. and smaller are available. The tees are made in sizes 2- to 8-in.

This line of seamless pipe fittings for welding is said to permit entire pipe systems fabricated by welding to be installed with only the use of true circumferential welds, to simplify erection, to be lighter in weight than cast steel fittings, to require less space in erection, and in addition, to permit easy and economical insulation.



Welded fitting units

Welding fittings from units

The elbows are said to be made without thinning or buckling of the walls, and to have short tangents to facilitate welding and accurate lining up. They are made of the standard center to end measurement of American standard extra heavy screwed fittings.

The manufacturer states tees are made to pipe thickness at the ends, with the body thickened up around the outlet to give required reinforcement. The tees have sweep outlets.

The bull plugs are formed to an ellipsoidal shape to withstand end pressure. Taylor butt welding flanges have a long fillet at the hub and are said to provide full American standard strength requirements.

Natural Gas Engine Power

OF INTEREST at this time to users of power, in view of the availability of natural gas to many sections of the country, is the natural gas engine.

It is said a gas engine was put on the market at Sterling, Ill., in 1880 by the Charter Gas Engine Co. Because artificial gas was relatively expensive, as compared with natural gas where it is produced, the use of natural gas engines has been limited since that time to those areas where natural gas was produced. Improvements have been made in the design and construction of the Charter engine since it was introduced and it is still being sold in those localities where it has proved economical.

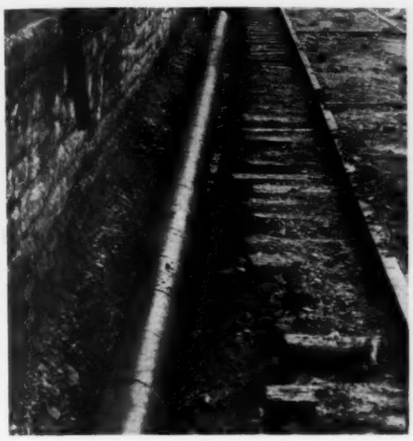
With the extensive system of pipe lines which are being completed, this type of power may develop into an important competitor of other forms of power now more economical.

Spiral Welded Pipe

SPIRAL WELDED PIPE is the latest development announced by the American Rolling Mill Co., Middletown, Ohio.

It is claimed this new "Armco" spiral welded pipe is light in weight, easy to handle, and the inside wall is smooth, reducing friction and pumping costs.

Armco spiral welded pipe is manufactured in jointless lengths up to 40 ft. It is said there are no interior grooves nor ridges and that it is easy to weld, and can be used with any standard coupling.

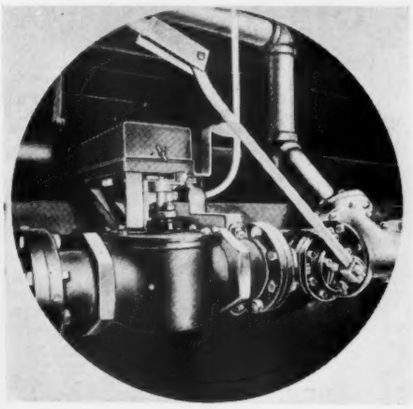


Spiral welded pipe in lengths to 40 ft.

Armco is supplying this pipe in sizes from 6 in. to 24 in. in diameter, in any wall thickness from 18 gage to ¼ or ⅜ in. It can be furnished with any type of coating desired.

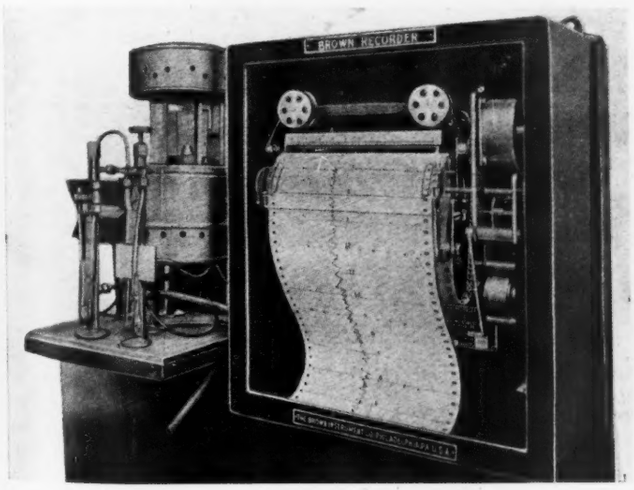
New Instrument Measures and Controls Heating Effect of Gases

AN INSTRUMENT for checking the heating effect of fuel gas has been developed by the Brown Instrument Co., Philadelphia, Penn. The manufacturer claims the new instrument, called the "Flame Analyzer," can be supplied to measure, record and automatically control the heating effect of any gas. With this instrument industrial plants using producer gas are enabled to check and regulate the quality of their gas output with special reference to heating effect. It is said in many cases where it is necessary to dilute a rich gas, or enrich a lean gas, the flame analyzer equipment makes it easy to observe and record the quality of the output and also makes possible automatic control of the mixture.



Control mechanism at valve

The manufacturer states the Brown flame analyzer can be put into a plant and, when connected to the necessary control equipment, it will maintain a uniform pilot flame in the analyzer, which in turn will result in unvarying flames throughout the plant.



Instrument controls gas heating

New Double Sealed Ball Bearing Used on Motors

THE Howell Electric Motors Co., Howell, Mich., announces a new double sealed ball bearing as the standard bearing on all "Red Band" motors.

The balls and ball race-way of this bearing are packed in a congealed oil and completely sealed in a dust-proof room at the point of manufacture. It is said this eliminates all possibility of dust, dirt or other injurious abrasives entering the interior of the bearing in the process of manufacture.

Advantages claimed for this bearing are that it prevents dust, dirt, residue from grease or any injurious foreign material from entering race way in operation and that it makes a motor bearing which runs free at all times.

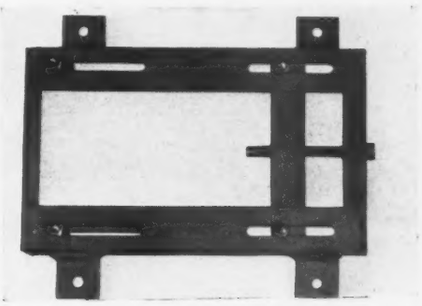
Construction of sealed ball bearing

For lubrication it is said the bearing automatically uses only the fine oily part of the grease in the outside bearing chamber, or the upper bearing chamber in case it is a vertical motor. This unit is a bearing cartridge which lends itself readily to assembly, states the manufacturer.

New Motor Base

THE LINCOLN Electric Co., Cleveland, Ohio, recently announced the manufacture of a welded steel motor base of one-piece construction.

These new bases are designed to be used instead of slide rails. They are formed of rolled steel angles and flat bar stock fused together by the electric arc. Flanges of the angles to which the motor is bolted are slotted to permit moving the motor on the base. A screw adjustment is provided for moving the motor on its base in such cases.



Electric welded motor base

Drilled angles are welded to the sides form hold-down lugs for securing the base in position.

New Type of Safety Nut

A NEW TYPE of safety nut is announced by the Safety Nut Corp., Philadelphia, Penn. This nut has a slot cut in the face through which a key is driven. The slot leads to the threads of the bolt. The nut is tapped to permit this key to be driven around one circumference of the bolt. The key is driven after the nut has been pulled tight. It is said this nut will stay secure under the most intense vibration, but that it can be removed in the usual manner without unusual difficulty.

The Rock Products Market

Wholesale Prices of Aggregates

(F.O.B. Plant or City Designated)

Prices given are for crushed limestone per ton, unless otherwise stated

	Crushed stone: Screenings, ¼ in. down	Crushed stone: ½ in. and less to 2½ in.	Sand: ¼ in. and less	Gravel, ½ in. and less to 2 in.	Slag: Screenings, ¼ in. down	Slag: Crushed, ½ in. and less to 3 in. and larger
EASTERN:						
Bethlehem, Penn.					.50– .60	.60–1.00
Birdsboro, Penn. (trap rock)	2.10	2.20–2.50				
Boston, Mass. (s)			1.15	1.75		
Buffalo, N. Y.					1.50d	1.50–1.60d
Clarence, N. Y.			1.00–1.10	1.00–1.10		
Georgetown, D. C.			.85	1.30		
Hillsville, Penn..	.85	1.35				
Hartford, Conn. (trap rock)	1.70	1.70–1.95	1.40*	1.50–1.70		
New York City*			1.00	1.50		
Montoursville, Penn.			.60–1.00	.40		
Oriskany Falls, N. Y.	.50	1.00–1.35				
Philadelphia, Penn. (a) (trap rock)	3.45–5.70	3.45	1.40–1.50	1.95–2.20		2.95
Pittsburgh, Penn.			1.20	1.00		
Rochester, N. Y.			1.40	1.40		
CENTRAL:						
Alton, Ill.	1.75	1.75				
Cape Girardeau, Mo.	.90	1.00–1.10				
Chicago, Ill.			1.00	1.00		
Cypress, Ill.	.85–1.15	.85–1.15				
Dubuque, Ia.	1.00	1.00				
Eau Claire, Wis.			.30– .40	.50– .85		
Grand Rapids, Mich.			.40– .45	.60– .70		
Hannibal, Mo.	1.40	1.40				
Jackson, Ohio					.65‡	1.05–1.55‡
Indianapolis, Ind.			.54*	.81– .95*		
Riverton, Ind.			.40– .75	.60– .85		
Ironton, Ohio					1.05‡	1.45–1.80‡
Maplewood, Mo. (g)	1.25–1.50	1.25–1.50				
Milwaukee, Wis.	1.14	1.24	.62	.72		
Stone City, Ia.	.75	1.00–1.10p				
St. Louis, Mo.			.90	1.10–1.25		
St. Paul, Minn.	.75	1.25	.35	1.25		
Sheboygan, Wis.	1.00	1.00				
Toledo, Ohio	1.10	1.60			1.00	1.10
SOUTHERN:						
Ashland, Ky.					1.05‡	1.45–1.65‡
Atlanta, Ga. (granite)	1.10	1.60				
Birmingham, Ala.					.55‡	.80–1.25
Columbia, S. C. (granite)		1.40–1.60p				
Fort Spring, W. Va.	.30	1.15–1.35				
Houston, Tex. (j)			v1.25*	1.95v		
Knoxville, Tenn.			.60– .85	1.00–1.50		
Longdale, Va.					.75	.95–1.25
Richmond, Va.			1.15–1.30	1.55–1.80		
Roseland, La.			.20	.45		
San Antonio, Tex.	1.50–1.75	1.50–1.75c				
Tyrone, Ky.	.50– .90	.50–1.25				
Waco, Tex.			.90	1.15–1.25		
WESTERN:						
Denver, Colo.			1.15–1.45	1.75–2.50		
Long Beach, Calif.			1.70s	2.30s		
Los Angeles, Calif.			1.40	1.90		
Phoenix, Ariz.			1.65–1.75*	1.50–2.00*		
Salt Lake City, Utah			.65	.45– .65		
San Francisco, Calif.			1.45–1.85	1.45		
Seattle, Wash.			1.25*	1.25*		
Spokane, Wash. (s)			1.00–1.75*	1.25–2.00*		
Tulsa, Okla. (u)	.70	1.20–1.60				

*Prices per cu. yd. †Less 10c per ton monthly settlements disc. ‡Prices less 5c disc. per ton for payment 15th following month. (a) Consumer prices subject to cash disc. of 10c per ton. (b) ½ in. to 1½ in. (c) 1½ in. and less. (d) F.o.b. trucks at plant. (e) Asphalt filler dust in bulk 4.75, in 3-ply paper bags, 5.40. (f) Price per cu. yd. f.o.b. scows. (g) Building stone, 2.00 per ton. (h) F.o.b. cars Knoxville, including tariff for 15 mile R. R. haul. (j) Price f.o.b. cars. (k) Cash disc. 2%. (m) F.o.b. plant. (n) 5% cash disc. payment 10 days; 30 days net. (o) F.o.b. cars or truck at plant. (p) ¾ in. to 2½ in. (s) Delivered to job by truck. (v) Less 10c cash disc.

Whiting

St. Louis, Mo., per ton	15.00*
Chicago, Ill., prices per ton.	
Domestic putty whiting	10.00–12.00
Domestic precipitated whiting	15.00–20.00
Imported bolted whiting	30.00–35.00
Philadelphia, Penn. — English chalk whiting packed in 50-lb. paper bags, per ton, in carloads	15.00

*Packed in bbl., f.o.b. St. Louis.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	**20.00**
30– 60 mesh	**22.00**
60–100 mesh	**18.00**
100 mesh and finer	**9.00**
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, incl. cost of bags	24.00

Agricultural Limestone

(Crushed)

Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder	3.50
Cypress, Ill. — Analysis, 94% $MgCO_3$; 50% thru 100 mesh, per ton, .95; 90% thru 50 mesh, 1.05; 50% thru 50 mesh and 90% thru 4 mesh, 1.10; 50% thru 4 mesh	1.15
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk..	1.10
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton	1.70
Dubuque, Ia. — Analysis, 58% $CaCO_3$; 38% $MgCO_3$; 50% thru 100 mesh; per ton	1.00
Fort Spring, W. Va. — Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 50% thru 100 mesh; bulk, per ton	1.15
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh	1.25
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; in bags	5.00
Lannon, Wis. — 90% thru 100 mesh, 50% thru 100 mesh	1.50–2.00
Osborne, Penn. — Analysis. 94.89% $CaCO_3$, 1.50% $MgCO_3$; 100% thru 20 mesh; 60% thru 100 mesh and 45% thru 200 mesh, per ton	3.50
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75

(a) Less 50c commission.

Agricultural Limestone

(Pulverized)

Alton, Ill.—90% thru 100 mesh	4.75
Bedford, Ind.—95% thru 10 mesh, per ton, f.o.b. plant	1.30–1.50
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; bulk, 3.00; in bags	**4.50**
Hillsville, Penn.	3.00–4.50
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
West Rutland, Vt. — Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$; 90% thru 50 mesh; 60% thru 100 mesh, bags, per ton, 3.75; bulk	2.50

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton..	6.00

Roofing Slag

Prices given are per ton f.o.b. city named, unless otherwise noted.

Ashland, Ky.	2.05*
Bethlehem, Penn.	1.00–1.50‡
Birmingham, Ala.	2.05*
Buffalo, N. Y.	2.50†
Ironton, Ohio	2.05*
Jackson, Ohio	2.05*
Longdale, Va.	2.50
Toledo, Ohio	1.10

*Less 5c ton disc. for pay. 15th following month. †Price f.o.b. trucks at plant, subject to discount of 10c per ton for payment on or before the 15th of following month. ‡F.o.b. plant.

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Martinsville, Va.	
Mine scrap, per ton	16.00
Franklin, N. C.	
Mine scrap, per ton, f.o.b. mine	15.00
Mine run, per ton, f.o.b. mine	10.00
Clean scrap for wet grinding, per ton, f.o.b. mine	20.00
Ground mica, per ton at mill, 20 mesh, 25.00; 40 mesh, 30.00; 60 mesh, 35.00; 100 mesh	50.00
Roofing mica, per ton at mill, schist, 17.00; white	30.00
Punch, per lb.	.05

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.	.....	†1.87	2.92¶
Birmingham, Ala.	.....	†1.56	2.61¶
Boston, Mass.	.43½	†1.74	2.48¶
Charleston, S. C.	.....	1.89†	2.94¶
Chicago, Ill.	.....	1.35†	2.11¶
Cincinnati, Ohio	.....	1.38†	2.16¶
Cleveland, Ohio	.....	1.35†	2.34¶
Columbus, Ohio	.....	1.38†	2.26¶
Dallas, Tex.	.....	1.76	2.81¶
Dayton, Ohio	.....	1.25†	2.19¶
Detroit, Mich.	.....	1.45†	2.30¶
Houston, Tex.	.....	1.98	3.03¶
Jackson, Miss.	.....	†1.94	2.99¶
Jacksonville, Fla.	.....	†1.96	3.01¶
Indianapolis, Ind.	.....	1.39†	2.04¶
Kansas City, Mo.	.31¾	1.27†	2.17¶
Louisville, Ky.	.....	1.41†	2.09¶
Memphis, Tenn.	.....	†1.73	2.78¶
Milwaukee, Wis.	.....	1.45†	2.20¶
New Orleans, La.	.....	1.86†	2.96¶
New York, .N Y.	.37½	1.49†	2.24¶
Omaha, Neb.	.45¼	1.81†	2.29¶
Portland, Ore.	.....	2.50‡	.....
Reno, Nev.	.....	2.96‡	.....
St. Louis, Mo.	.....	1.20†	2.09¶
San Francisco, Calif.	.....	2.24‡	.....
Savannah, Ga.	.....	1.89†	2.94¶
Seattle, Wash.	.....	2.45	2.50c
Tampa, Fla.	.....	2.00†	3.16¶
Toledo, Ohio	.....	1.31†	2.28¶
Topeka, Kan.	.37½	1.50	2.46¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Hudson, N. Y. (d)..	.....	1.21–1.36†	2.29¶
Lime & Oswego, Ore.	.....	2.50	.....
Limedale, Ind.	.....	1.10†	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% discount payment 10th of month following invoice date. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. (c) Quick-hardening "Velo," packed in paper bags, 10c discount 10 days. (d) 1.36 trucks, mill; 1.21 cars, mill.

Glass Sand

(Silica sand is quoted washed, dried and screened)

Klondike, Mo.	2.00
Millville, N. J.	2.00
Ohlton, Ohio	2.40

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Eau Claire, Wis.	.....	.50
Ohlton, Ohio	1.60	1.50

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–¶14.50	¶12.50–¶14.50
Cardiffe, Md.—Crushed green marble	12.50– 14.50	12.50– 14.50
Crown Point, N. Y.—Mica Spar	.....	¶9.00a–¶12.00
Davenport, Ia. — White limestone, in bags, ton	¶6.00	¶6.00
Los Angeles, Calif.—(a) White	¶11.00–¶13.50	¶11.00–¶13.50
Snowflake	.....	¶11.00–¶13.50
Golden, browns, grey, blues, blacks	¶16.00–¶18.50	¶16.00 ¶18.50
Dolomite, Calif. (Lone Pine)—(a) White	¶8.80– ¶8.80	¶8.80– ¶8.80
Snowflake	.....	¶8.80– ¶8.80
Golden, browns, grey, blues, blacks	¶13.80–¶13.80	¶13.80–¶13.80
Middlebrook, Mo.—Red	.....	20.00– 25.00
Middlebury, Vt.—White	.....	¶9.00–¶10.00
Randville, Mich.—Crystalite, crushed white marble, bulk	4.50	4.50– 5.00
Tuckahoe, N. Y.	6.00	.....
Warren, N. H.	.....	¶7.00– 11.25

¶C.L. ‖L.C.L. *Per 100-lb. (a) Including bags.

Art and Cast Stone Aggregates

Cardiffe, Md.—Green marble fines in carloads; bulk, 7.50; in bags....	10.00
Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00 ‖12.50
Dolomite special cast stone, wet cast aggregate, white, ¼-in. to dust	a5.30

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Chicken Grits

Cypress, Ill.—(Agstone)	1.10
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
Gibsonburg, Ohio—(Agstone)	10.00
Los Angeles. Calif.—(Gypsum), per ton, including sacks	7.50– 9.50
Marble grits, per ton, incl. sacks	10.00–12.50
Maplewood, Mo.—(Limestone), per ton	12.00
Middlebury, Vt.—Per ton (a)	10.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Randville, Mich.—(Marble), per ton, bulk	6.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Masonry Cement

The prices shown here are for various brands of masonry and mortar cement, including cost of bags.

	Per bag	Per bbl.
Atlanta, Ga.	.42¼	1.69–2.24*
Baltimore, Md.	.40¾	1.63–2.21*
Birmingham, Ala.	.42¼	1.69–2.21*
Boston, Mass.	.....	2.25*
Buffalo, N. Y.	.....	2.10*
Charleston, S. C.	.42¼	1.69–2.39*
Chicago, Ill.	†.46	†1.84–2.09*
Cincinnati, Ohio	†.43½	†1.74–1.99*
Cleveland, Ohio	†.46¾	†1.87–2.12*
Columbus, Ohio	.....	†1.68–2.07*
Dallas, Tex.	.....	2.69*
Dayton, Ohio	.....	†1.66–2.02*
Des Moines, Ia.	.....	2.34*
Detroit, Mich.	†.46¾	†1.87–2.12*
Indianapolis, Ind.	.....	†1.70–1.95*
Jackson, Miss.	.....	2.31*
Jersey City, N. J.	.42¼	1.69–2.20*
Kansas City, Mo.	.....	2.39*
Louisville, Ky.	†.40½	†1.62–1.97*
Memphis, Tenn.	†.48½	†1.94–2.20*
Milwaukee, Wis.	.....	2.12*
New Orleans, La.	.....	2.43*
New York, N. Y.	.42¼	1.69–2.20*
Norfolk, Va.	.41¾	1.67–2.31*
Philadelphia, Penn.	.41¼	1.65–2.21*
Pittsburgh, Penn.	.42¼	1.69–2.10*
Richmond, Va.	.41¼	1.65–2.37*
St. Louis, Mo.	†.45¾	†1.83–2.10*
Toledo, Ohio	†.46	†1.70–2.09*
Tulsa, Okla.	.....	2.61*
Wheeling, W. Va.	.42¼	1.69–2.09*
Winston-Salem, N. C.	.....	2.31*

*Price for delivery in car lots to contractors at point given, including value of cloth sacks, for which refund is made of 10c each when returned in good order. Shipped in paper bags 25c a bbl. less. Price subject to cash discount of 10c bbl. for payment 15 days from date of invoice.

†Packed in paper sacks; price includes cost of sacks, and is subject to 10c bbl. discount for payment in 15 days.

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.	4.25– 4.75
Mt. Pleasant, Tenn.: (Screened)	
B.P.L. 78%, furnace lump	6.25
B.P.L. 72%, run of plant lump and fines	5.00– 5.50

Ground Rock (2000 lb.)

Gordonsburg, Tenn.	5.25– 6.00
Mt. Pleasant, Tenn.—(Lime phosphate) —B.P.L. 75%; per ton, bags extra	12.80

Florida Phosphate (Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines	
68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; lowest net prices per ton f.o.b. plant

City or shipping point	Molding: Fine	Molding: Coarse	Molding: Brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.00	.....	.....	3.50	.....
Columbus, Ohio	1.50	1.50	.....	.....	.....	3.50	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.00b	.....
Elco, Ill.	Amor. silica, 90-99½% thru 325 mesh, $10.00						
Montoursville, Penn.	.....	.....	.....	1.35a	.....	.....	.....
New Lexington, Ohio	1.75	1.25	.....	.....	.....	.....	.....
Ohlton, Ohio	1.60	1.60	.....	1.60	1.60	1.60	.....
South Vineland, N. J.	Washed silica, 1.50 per ton; dry white, 2.00 per ton						

*Damp. (a) To 1.60. (b) To 3.00.

Wholesale Prices of Slate

Lowest prices f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh, 6.00 per ton in paper bags

Roofing Slate

Prices per square—Standard thickness

City or shipping point	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—						
No. 1 slate	.....	12.50	18.00	21.50	25.00	30.00
Hard vein	9.00–11.00	15.00	22.00	26.50	32.00	37.00
No. 2 slate	8.00– 9.00	.....	.....	.....	.....	.....
Pen Argyl, Penn.—						
Graduated slate	.....	16.00	23.00	27.00	37.00	46.00

Albion blue-grey roofing slate, No. 1 clear 7.25; mediums 8.00; No. 1 ribbon 8.00.

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.

(b) Prices other than 3/16-in. thickness include nail holes.

(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Lime Products

(Lowest carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Buffalo, N. Y.	7.00	5.50	5.50	11.00	6.00	8.00	6.00	.....
Cedar Hollow, Devault, Mill Lane, Knickerbocker, Rambo and Swedeland, Penn.	.....	9.00c	9.00c	9.00c	7.50	9.00	8.50	.....
Lime Ridge, Penn.	.....	.....	8.00	.....	6.00	7.00	4.50	.....
CENTRAL:								
Cold Springs, Ohio	.....	5.50	5.50	.....	.....	.....	.....	.....
White Rock, Gibsonburg, Marblehead, Ohio, and Huntington, Ind.	7.00*	5.50	5.50	11.00	6.00	8.00	6.00	.....
Delaware, Ohio	7.00	5.50	5.50	6.00	.....	.....	6.00	.....
Sheboygan, Wis.	.....	10.50	10.50	10.50	.....	13.50a	9.50	20.00¶
Tiffin, Ohio	.....	.....	.....	.....	6.00	8.00	.....	.....
Woodville, Ohio	7.00	5.50	5.50	9.00	6.00	8.00	6.00	.....
SOUTHERN:								
Knoxville, Tenn.	.....	8.00	8.00	8.00	.....	.....	6.50	12.60
Eagle Mountain, Va.	13.00	8.00	8.00	8.00	6.50	8.00	6.50	.....
WESTERN:								
Little Rock, Ark.	.....	14.30	.....	14.30	.....	.....	11.40	17.40
Kirtland, N. M.	.....	.....	.....	.....	.....	.....	12.00‡	.....
San Francisco, Cal.	(b)20.00	20.00	12.00	20.00	.....	.....	.....	.....
San Francisco, Calif.	§19.00	15.00	12.50	14.00	11.00	17.60†	11.00	17.60‖

(a) In 100-lb. bags. (b) Woodburnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (c) In 50-lb. paper. (d) To 10.00. *At White Rock and Gibsonburg, Ohio. ‡To 15.00. ¶In 200-lb. steel barrels. ‖Refund for return of barrels. †Refund for return of burlap bags. §To dealers and industrial concerns in carload lots.

Cement Building Tile

Lexington, Ky.:	
5x8x12, per 1000	**55.00**
4x5x12, per 1000	**35.00**
Longview, Wash. (Stone Tile):	
4x6x12, per 1000	60.00
4x8x12, per 1000	70.00

Wichita, Kan. (Uncolite Tile)	Plain	Glazed
4x8x16-in., each	0.08½	0.13
8x8x16-in., each	.10	.15
8x8x16-in. (rock face), each (Duntile)	.11	.16
8x8x12-in., each	.10	.14
6x8x12-in., each	.09	.13
6x6x12-in., each	.08½	.12
4x5x12-in., each	.05	.08
4x4x12-in., each	.04½	.07½

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French and Spanish tile, 9x15-in., per sq.	9.50–12.00
Closed end shingle, 8½x12½ in., per sq.	11.00–13.00

Cement Drain Tile

Grand Rapids and Saginaw, Mich.—Price per 1000 ft. in carload lots.

4-in.	42.00	15-in.	341.25
5-in.	52.50	18-in.	472.50
6-in.	78.75	20-in.	630.00
8-in.	115.50	22-in.	787.50
10-in.	173.25	24-in.	892.50
12-in.	199.50		

Longview, Wash.—Drain tile, per foot

3-in.	**.06**	**8-in.**	**.18**
4-in.	**.08**	**10-in.**	**.25**
6-in.	**.12**	**12-in.**	**.35**

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Brookville, Penn.*: 8x8x16	18.00§–23.00a
8x10x16	25.00§–28.00a
Camden, N. J.: 8x8x16, each	.17b
Columbus, Ohio: 8x8x16	§10.00–a11.00*
Lexington, Ky.:	
8x8x16	**‡18.00***
8x8x16	**†16.00***
Omaha, Neb. (Prices f.o.b. yard)	
8x 8x16, each	0.09
8x12x16, each	.11½
8x 4x16, each	.06
8x 3x16, each	.06
8x 6x16, each	.08

*Price per 100 at plant.
†Rock or panel face.
‡Face. §Plain. (a) Rock face. (b) Less 10%.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Birmingham, Ala.	13.00	
Longview, Wash.	16.50	22.50– 45.00
Milwaukee, Wis.	14.00	15.00– 42.00
Prairie du Chien, Wis.	12.00	20.00– 22.50

Potash Feldspar

Keystone, S. D.—White; analysis, K_2O, 12.50%; Na_2O, 2.25%; SiO_2, 64.50%; Fe_2O_3, 0.03%; Al_2O_3, 19.50%; pulverized, 98% thru 200 mesh; bulk 14.00–16.50

Los Angeles, Calif.—White; analysis, K_2O, 12%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.05%; Al_2O_3, 19%; pulverized, 98% thru 200 mesh; in bags, 20.50; bulk 19.00

Rochester, N. Y.—White; analysis, K_2O, 13%; Na_2O, 1.50%; SiO_2, 65%; Fe_2O_3, 0.06%; Al_2O_3, 20%; pulverized, 98% thru 200 mesh; in bags, 23.50; in bulk 22.00

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk 15.00

Topsham, Me.—White; analysis, K_2O, 9.50%; Na_2O, 2.75%; SiO_2, 72.50%; Fe_2O_3, 0.08%; Al_2O_3, 16.50%; pulverized, 98% thru 200 mesh; bulk 16.00–17.50

Trenton, N. J.—White; analysis, K_2O, 10%; Na_2O, 2%; SiO_2, 69%; Fe_2O_3, 0.06%; Al_2O_3, 17.50%; pulverized, 98% thru 200 mesh; in bags, 21.50; bulk 20.00

West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk 19.00

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	**40.00**	**60.00**	**70.00**
Altadena, Calif.	45.00	55.00	65.00
Asheville, N. C.	30.00	40.00	50.00
Atlanta, Ga.	**29.00**	**42.50**	**53.00**
Auburn, Wash.	.....	50.00	65.00
Brownsville, Tex.	...	**53.00**	**62.50**
Brunswick, Me.	29.50	42.25	55.00
Chula Vista, Calif.	32.50	42.50	50.00
Daytona Beach, Fla.	45.00	55.00	65.00
Frostproof, Fla.	45.00	65.00	75.00
Houston, Tex.	36.00	53.00	66.00
Klamath Falls, Ore.	50.00	60.00	70.00
Longview, Wash.	.....	50.00	60.00
Los Angeles, Calif.	**29.00**	**39.00**	**45.00**
Macon, Ga.	25.00	35.00	45.00
Mattituck, N. Y.	**45.00**	**55.00**	**65.00**
Medford, Ore.	**50.00**	**55.00**	**70.00**
Memphis, Tenn.	45.00	50.00	60.00
Mineola, N. Y.	40.00	50.00	60.00
Nashville, Tenn.*	32.00	50.00	60.00
New Orleans, La.	45.00	55.00	65.00
Norfolk, Va.	33.00	46.00	60.00
Passaic, N. J.	**40.00**	**52.50**	**70.00**
Pawtucket, R. I.	27.50	41.25	55.00
Presidio, Tex.	55.00	65.00	75.00
Roanoke, Va.	32.50	40.00	50.00
Salem, Mass.	**40.00**	**60.00**	**75.00**
San Antonio, Tex.	**37.00**	**46.00**	**60.00**
San Diego, Calif.	**35.00**	**44.00**	**52.50**
Spartanburg, S. C.	32.50	40.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

Soda Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk 18.00

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh 7.00– 7.50
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.

Emeryville, N. Y.:
Ground talc (200 mesh), bags 13.75
Ground talc (325 mesh), in bags 14.75

Henry, Va.:
Crude (mine run), bulk 3.50– 4.50
Ground talc (150-200 mesh), in bags 6.25– 9.00

Hailesboro, N. Y.:
Ground talc (300-350 mesh), in 200-lb. bags 15.50–20.00

Natural Bridge, N. Y.:
Ground talc (325 mesh), bags 10.00–15.00

Suit to Determine Who Owns River Gravel

AN INDICTMENT, charging unlawful removal of property, was on file in Hawesville, Ky., recently against the Koch Sand and Gravel Co., Evansville, Ind.

The indictment alleged that workmen of the company removed nearly $15,000 worth of sand from the Ohio river.

Handcock county officials intimated suit might be filed against the Koch company to recover the $15,000.

Koch Sand and Gravel Co. officials have issued a statement as follows:

"We find this to be a test case. Heretofore, we have been paying the farmers for the right to dig sand and gravel in the river and some of the counties feel that this should be paid to them and not the bordering property owner.

"This action is brought to determine who is really entitled to this money.

"We welcome the action, as we are anxious to know just what our position is."—*Evansville* (Ind.) *Press.*

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in
Grand Rapids, Mich.																	
Sewer (c)	.....	.09	.14	.21	.27	.36	.65	.78	1.04	1.17	1.45	2.16	.....	.....	.....	.....	.....
Culvert (d)	.....	.....	.....	.57	.67	.93	1.20	1.45e	.....	1.80	2.10	2.45	3.30	4.00	5.10	6.00	7.45
Longview, Wash.	**.17½**	**.24½**	**.30**	**.42**	**.60**	**.90**	**1.26**	.....	.....	**2.16**	.....	**3.60**	**4.50**	**5.50**	**6.50**	**7.50**	.....
Tiskilwa, Ill. (a)	.....	.....	.....	.....	.75	.85	95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Wahoo, Neb. (b)	.....	.....	.....	.....	.....	.85½	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31

(a) Reinforced. (b) Reinforced, 15.40 per ton, f.o.b. plant. (c) To dealers. (d) To contractors. (e) 21-in. pipe.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev.	.....	3.00–5.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Los Angeles, Calif. (a)	4.90	.....	7.90–8.90	12.20e	13.20l	.....	13.20l	.....	38.00	.....	21.12	23.34	.....
Medicine Lodge, Kan.	1.45	.....	.....	.....	.....	.....	11.50b	.....	16.00b	.....	.....	.....	.....
Port Clinton, Ohio	4.00	6.00–8.00	6.00–8.00	10.00m	10.00n	10.00n	20.00k	8.00–11.00	24.50f	26.00g	15.00h	15.00h	27.00j
Victor, N. Y.	1.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	**5.00**	**5.00**	**7.00**	**13.00**	**14.00**	**14.00**	.....	.....	.....	.....	**20.00**	**25.00c**	**33.00d**

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Plaster board, ⅜x16x48-in., weight 1850 lb., 16c a yd. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (e) To 13.20. (f) To 27.50. (g) To 29.00. (h) To 16.00. (j) To 28.00. (k) To 23.00. (l) To 14.20. (m) To 12.00. (n) To 13.00.

News of All the Industry

Incorporations

Granite Sales Corp., New Orleans, La., $10,000.

Great Lakes Sand Co., Indianapolis, Ind., filed notice of final dissolution.

Rock Sand Co., Morristown, N. J., $125,000. King and Vogt, Morristown. To produce trap rock and stone.

Canadian Rockbestos, Ltd., Montreal, Canada, 10,500 class "A" shares and 12,500 class "B" shares, both of no par value.

Tyler Sand Co., Inc., Norfolk, Va., 300 shares common of no par value and $50,000 preferred. D. F. Tyler, president, 716 E. Charlotte St., Norfolk.

Interstate Granite Corp., Charlotte, N. C., authorized capital, $10,000; subscribed stock, $300; by R. E. Scoggins, Lou Huntley and John H. Small, Jr., Charlotte.

Benedict Stone Products Co., 122 S. Michigan Ave., Chicago, Ill., 10,000 shares common of no par value and $250,000 preferred. John C. Hobson, George H. Redding and B. D. Landers. To deal in concrete products.

Quarries

Cochrane, Wis. The county highway committee purchased a stone quarry of Wm. Krause recently.

Consumers Co., Chicago, Ill., had a premature explosion at its quarry in Hillside recently. John Koess, 40-year-old workman, was severely injured.

Lufkin, Tex. A stone quarry has been opened near Huntington to supply rock for jetties at Port Arthur.

Radford, Va. The city has purchased a rock crusher to be operated by city prisoners for city purposes only.

Blue Springs, Mo. Stripping operations for the opening of a new county quarry are now under way. Quarrying operations at the old quarry will cease with the opening of the new quarry.

Burton limestone quarry, Monarch, Colo., which supplies the Colorado Fuel and Iron Co. steel plant at Pueblo, will open about July 1. The entire output is used by the steel plant.

Bilhorn, Bowers and Peters, St. Louis, Mo., has opened a quarry near Sioux City, Ia. Rock for construction of dikes in the Missouri river will be obtained from this quarry.

Peru, Calif. Shipments from the rock crushing plant at this location has started. Delay in beginning operations was caused by rearrangement of machinery that was found to be necessary.

Trap Rock Co., Minneapolis, Minn., has plans for a new rock crushing plant at Dresser Junction, Wis., to cost about $100,000 complete. Bids are being taken at once.

Narehood brothers of McClure, Penn., recently purchased property in Milton, Penn., and are now erecting a stone crushing plant. It is said the capacity of the new plant will be 1000 tons per day.

Caldwell, Ohio. A representative of the local Kiwanis Club recently interviewed the director of state highways. It is said a promise to use crushed rock produced within the county on county road improvements was obtained.

Delbert Adams and **Charles Larmon,** Salem, N. Y., have submitted samples of crushed stone from the Adams farm to the state highway department. A crushing plant may be erected if the quality and quantity of rock justifies.

El Dorado Limestone Co., near Sacramento, Calif., has resumed operations, after completing the installation of a standard-gage railroad spur to the property. Its product is supplied to sugar plants and for use in paint and putty.

Louisville, Ky. The city is opening a new quarry near Avoca, to be equipped with Allis-Chalmers crusher and new Telsmith reduction crusher. It was expected to be in operation about July 1.

Mount Airy, N. C. Quarrying of granite on land owned by E. C. Bivens will begin shortly by a Philadelphia, Penn., firm that has leased the mineral rights. The lessees expect to install machinery and to have an output of 50 to 75 cars daily.

Edward Sidebotham and Son, Inc., Corona, Calif., is clearing away the old Phillips quarry and is preparing to install rock crushing machinery there. Contract for power has been signed. Capacity of 300 tons per day is planned at the beginning. The above firm is a contracting organization.

Aetna Clay and Rock Products, Inc., is erecting a rock plant in Little Tujuanga Canyon near San Fernando, Calif., and expected to begin operation by June 15. Besides producing crushed stone for concrete work and road building, the company expects in the near future to develop a large deposit of brick shale near the quarry. Development of a deposit of feldspar is also contemplated. Officers of the company are H. R. Taylor, Sr., president and general manager, and I. C. Hanson, secretary.

Sand and Gravel

Hudson, Ia. The county has leased a gravel pit near here which is to be used in road work.

Michigan Material and Concrete Co., Centerville, Mich., started production at its plant June 11 and is now furnishing customers with gravel.

Bellevue, Wash. The county gravel bunkers have been moved to the Claringould-Bechtel pit and work there has started.

Roseau, Minn. A lease has been signed by the county on property in Oaks township where road gravel will be obtained.

F. S. Anderson, Guthrie Center, Ia., has finished stripping the gravel pit of the Ada Johnson property.

Missouri Gravel Co., La Grange, Mo., is building another pumping unit at its plant on the state land.

Thille brothers, Cawker City, Kan., are operating a home designed and constructed sand dipper in the Solomon river near there.

George Suntheimer, Strasburg, Ohio, has leased a tract of gravel land from A. H. Bash and will continue his sand and gravel operations there. He is now moving his machinery to the new location.

Leonard Quist and **Swan Olson,** who recently formed the Sycamore Sand and Gravel Co., Sycamore, Ill., now have the plant in operation and can supply torpedo sand, mason sand and washed gravel.

Pacific Coast Aggregates Co., San Jose, Calif., suffered considerable damage through a fire in the pit of its Campbell gravel plant recently. The conveyor and machinery were ruined and other damage done.

Ironton Sand and Gravel Co., Ironton, Ohio, appraised at $24,071, was recently offered for sale and the highest bid submitted was $3700. All bids were rejected and the referee in bankruptcy ordered a readvertisement for sealed bids.

Cement

Marquette Cement Manufacturing Co., Chicago, Ill., was low bidder on 240,000 bbl. of cement for use in concrete revetment operations in the Memphis, Tenn., district.

Lehigh Portland Cement Co., Allentown, Penn., announced at the rededication of the Fogelsville plant safety trophy that an aggressive policy to keep the mills going had been adopted.

Marquette Cement Manufacturing Co. has received its twelfth 5000-bbl. shipment of cement at Memphis from its plants at Marquette, Mo., and La Salle, Ill.

Riverside Cement Co., Riverside, Calif., has suspended the manufacture of clinker at its plant. Plant improvements and mine development will be carried out while the plant is closed. Shipments will be made from stock in the interim.

Glens Falls Portland Cement Co., Glens Falls, N. Y., recently conducted a demonstration of "Velo" cement for the city officials of Glens Falls. It is said the company recently filled an order for 18,000 bbl. of "Velo" cement for road work in Onondaga county.

Canada Cement Co., Ltd., had a fatal accident at its Port Colborne plant recently. Charles Berlanger, 28, was installed killed when his clothing was caught in the conveyor of the ballast department. He was said to be a careful workman and, since the conveyor is closely protected, officials are unable to understand how his clothing was caught. Apparently no one witnessed the accident.

Gypsum

Gypsum, Lime and Alabastine, Ltd., Canada, is applying a "Gyprock" roof to the Canadian National hotel at Vancouver, B. C.

San Diego, Calif. The first shipment of gypsum from San Diego, Calif., to the Orient was recently made. The shipment consisted of 1000 long tons and was brought to San Diego from Plaster City by freight.

United States Gypsum Co., Chicago, Ill., received its first cargo of gypsum for the 1931 season at its Indiana Harbor plant June 8. The trip was made from the company's quarries at Alabaster, Mich., by its ship *Arthur Cornelius.* It is said the *Cornelius* would continue on its regular run from the quarries.

Lime

Clyde H. DeWitt, one of the owners of the defunct Pittsfield Stone and Lime Co., Pittsfield, Mass., has admitted misappropriating county funds while county treasurer to bolster the financial condition of the Pittsfield Stone and Lime Co.

Blue Diamond Co., Birmingham, Ala., producers of brick mortar and plaster, has been consolidated with Standard Building Material Co. and the business of the two firms is being conducted under the name of the latter.

Superior Lime and Mining Co., Wenatchee, Wash., has elected the following officers and directors: G. C. Jones, president; J. C. Bolinger, secretary-treasurer; W. W. Jones, T. P. Cowan, B. F. White, C. B. Burris, J. W. Hatley, John Savage, J. C. Bolinger, G. C. Jones and Gus Monosmith, directors. It is reported the company can secure contracts totaling around 20,000 tons a year for five years if the plant is producing by the first of the year.

Silica

Wendron Silica Co., Wedron, Ill., will soon have two new storage bins, 30 ft. by 125 ft. high, ready for use. The bins are being built of brick.

Miscellaneous Rock Products

Pacific Hardstone Brick Corp., Los Angeles, Calif., will erect a new sand-lime brick plant to cost about $200,000 complete.

Kalite Co., Ltd., Los Angeles, Calif., is reported to have a new deposit of volcanic silica from which acoustical plaster can be made. It is said eastern distribution of the material is contemplated.

United States Potash Co., Los Angeles, Calif., is planning a 2000 ton per day plant near Loving, N. M., to cost over $1,000,000. Permission has been secured to build a rail line to the new plant.

Idaho-American Fertilizer Co., Parma, Ida., is making plans to reorganize under the name of Mineral Fertilizer Co. Stock subscriptions are being taken now for the new company.

Jess McCann, who is operating mica mines in western North Carolina, says he has been advised by the Asheville Mica Co. the mica being produced from his newly opened mines is the best produced in that area.

Victor Chemical Works, Chicago, Ill., recently purchased 2500 acres of mineral lands in Maury county, Tenn. While no announcement has been made, it is reported this is the first step in developing an active phosphate rock industry there.

Basic-Dolomite, Inc., Fostoria, Ohio, has closed its Bettsville quarry operations following merger of the Basic Products Co. and Dolomite, Inc. The two burning plants will continue to operate and will be supplied from the Maple Grove quarry.

Price Fruit, Washington state land inspector in the Wenatchee district, is promoting the use of local diatomaceous earth for insulation. He was quoted at some length recently on the subject in a local paper.

Cement Products

Nu-Stone Products Co. will soon occupy its new plant at Tenafly, N. J. The new plant is a one-story building 65 by 260 ft.

Elkton Concrete Products Co., Elkton, Del., recently obtained publicity in the local paper through a story on the comparative insulating value of concrete products as a building material.

Aerocrete Corp. of America, New York, N. Y., won a news story in the New York Herald-Tribune recently about "raised bread" concrete, the headline description of aerocrete. A brief description and its application were given.

W. A. Crouch and **D. Gregory**, makers of ornamental concrete work, are now operating in the territory about Sikeston, Mo. Their "shop" is on wheels so that they can move to a new location with little expense when business slows up in a community.

Concrete Products Co., Vancouver, Wash., has begun operations and is manufacturing one-piece cast building tile on a machine designed and built by Valdie Allyn, one of the principal stockholders. The new company operates a sand and gravel plant as well.

Personals

Ralph Quelle, office manager of the Linwood Cement Co., Davenport, Ia., was recently married to Miss Verona Fersch of Los Angeles, Calif.

Harford B. Goddard, president of the Marietta Concrete Corp., Marietta, Ohio, was recently elected president of the Civitan Club of that city.

W. G. Hudson, district engineer of the Portland Cement Association, recently addressed a group of Louisiana highway maintenance employes who were attending a district school.

James C. Capper, manager of the Three Forks Portland Cement Co., Hanover, Mont., recently addressed the Rotary Club of Lewistown, Mont., on the development of cement and its uses.

Walter Rasmussen, district sales manager of metal lath of the United States Gypsum Co., Chicago, Ill., recently visited in Memphis, Tenn., and reported building activities progressing more rapidly than in many sections of the country.

L. J. Wheeler, **J. A. Lehaney** and **Mr. Jursists** of the Lone Star Cement Co., Kansas City, Mo., attended the safety celebration recently held at the Iola plant of the Lehigh Portland Cement Co.

R. M. Slater, advertising manager of the Ash Grove Lime and Portland Cement Co., Kansas City, Mo., showed the evolution of Ash Grove cement with movies to an interested group at a recent meeting of the South Central Business Association of Kansas City.

Darwin Meisnest, formerly with the Pacific Coast Cement Co., Seattle, Wash., recently reported on prospective business for the third quarter of 1931 in cement and cement products at a meeting of the Pacific Northwest Advisory Board of the American Railway Association. He is executive chairman of this committee of the association.

Frank W. DeWolf has been appointed chairman of the department of geology at the University of Illinois, to begin duties with the resumption of the next academic year, September 1. Dr. DeWolf resigned his administration of the state's geological survey to assume the management of the Louisiana Land and Exploration Co., Houston, Tex., where he has been since 1924.

Dr. Dorsey A. Lyon, supervising engineer of the Intermountain Station of the United States Bureau of Mines, located at the University of Utah, has resigned to give his entire attention to his duties as director of the Utah Engineering Experiment Station. Dr. Lyon has been with the bureau for nearly 20 years. Dr. George Thomas, president of the University, in commenting on this change, said, "The university considers itself particularly fortunate that Dr. Lyon will now be able to devote his whole time to carrying out the university's program for service to the mineral industry.

Obituaries

Charles F. Schendel, 51, formerly superintendent of the Rock County Sand and Gravel Co., Janesville, Wis., died June 21 in Milwaukee. Mr. Schendel had been forced to give up active work for the past year because of failing health.

Manufacturers

Fort Pitt Steel Casting Co., McKeesport, Penn., announces David Geissinger, formerly direct factory representative in Pittsburgh, is now affiliated with the company as special representative.

R. W. Andrews

Blaw-Knox Co., of Pittsburgh, Penn., announces the appointment of Roger W. Andrews, now assistant to the president, as vice-president and a director of Blaw-Knox International Corp. Mr. Andrews will reside in Paris and will be in charge of the company's European activities. He will take the place of C. T. Clack, who recently died in Dusseldorf, Germany. Prior to Mr. Andrews' association with the Blaw-Knox Co. he operated his own company, specializing in power plant and engineering equipment, principally in the manufacture and distribution of steam, gas and air purifiers under the trade name "Tracyfiers." In 1928 his company was merged with Blaw-Knox and he has been associated with them since. Mr. Andrews is a member of the Engineers' Society of Western Pennsylvania and the American Society of Mechanical Engineers.

Cement Gun Construction Co., Chicago, Ill., announces the new address of its New York office as 1169-71 Woolworth Bldg.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., announces G. L. Harris has been appointed manager of office systems. In his new position Mr. Harris will report to President Merrick.

Brown Instrument Co., Philadelphia, Penn., announces R. D. Bean has been appointed chief engineer. Mr. Bean's field investigations cover many applications of Brown industrial measuring instruments.

Fusion Welding Corp., Chicago, Ill., has appointed the Puritan Compressed Gas Corp., Kansas City, Mo., as distributors for the Weldite line of welding rods. Its territory will include the state of Kansas and the western portion of Missouri. Until recently this company has operated as the Kansas City Oxygen Gas Co.

A. J. Grindle

Beardsley and Piper Co., Chicago, Ill., announces a new department for the engineering, development and marketing of pulverized fuel systems for foundries and the industrial field generally. Aubrey J. Grindle, pulverized fuel engineer, will have full charge of the Beardsley and Piper department.

Lukenweld, Inc. (division of Lukens Steel Co., Coatesville, Penn.), has appointed W. R. McDonough and Co. as representative in the Cleveland district and the Dravo Doyle Co. as representative in the Pittsburgh territory. Lukenweld, Inc., designs and manufactures parts of machinery and equipment by gas-cutting, forming and arc welding of rolled steel.

Fairfield Engineering Co., Marion, Ohio, announces E. A. Thumlert has recently joined its sales organization. He will specialize in the design and sales of skip hoists for handling coal and ashes as well as ash hoppers and gates. Mr. Thumlert was connected with the Beaumont Co. for some 16 years and for several years was secretary and general manager of the Beaumont Co. He was later connected with the Palmer-Bee Co., Detroit, as a special sales engineer in charge of design and sale of skip hoists and ash hoppers.

Union Chain and Manufacturing Co., Sandusky, Ohio, has recently announced the appointment of the Industrial Gear and Machine Works, Oakland, Calif., as exclusive distributors for its line of industrial chain products in that territory. The principals of the western company are W. I. Brown and P. E. Haultain, who will handle sales.

The new representatives will maintain a complete stock of all standard sizes at the Oakland plant and at other points within the coast territory.

Lincoln Electric Co., Cleveland, Ohio, announces Maurice Taylor, welding technician, sailed for Tokyo, Japan, June 20, where he expects to confer with officials in charge of ship construction for the Imperial Japanese Navy, and supervise the installation of "Electronic Tornado" automatic welding machinery in the factory of the Kawasaki Co. The "Electronic Tornado" equipment was sold to the Kawasaki Co. by T. Y. Inagaky, Lincoln representative in Tokyo. This automatic arc welding machinery will be used to manufacture steel pipe from 30 to 72 in. in diameter in sections of 20 to 30 ft. in length.

Euclid Crane and Hoist Co., Cleveland, Ohio, announces that its name has been changed to Euclid-Armington Corp. as of July 1, 1931. On and after this date the road machinery division of Euclid Crane and Hoist Co. will manufacture and sell "Euclid" earth-moving equipment under the name of Euclid Road Machinery Co. of Euclid-Armington Corp. The officers of the Euclid Road Machinery Co. are: A. P. Armington, president and general manager; W. G. Fleming, vice-president and general sales manager; H. J. Zimmerman, vice-president and works manager; S. F. Armington, secretary and chief engineer; G. A. Armington, treasurer; A. Horton Bassett, assistant treasurer. The officers and personnel of Euclid-Armington Corp. remain the same as before the change. The Euclid Crane and Hoist Co. has moved to new quarters adjacent to its present location.

Communications formerly addressed to the road machinery division of Euclid Crane and Hoist Co. should be addressed to the Euclid Road Machinery Co., Cleveland, Ohio.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Protective Hats. Different types of protective hats and caps are illustrated. MINE SAFETY APPLIANCES CO., Pittsburgh, Penn.

Transport Mixers. Specifications of Rex "Motomixers," agitators and remixers are given in a new bulletin. CHAIN-BELT CO., Milwaukee, Wis.

Speed Reducers. Folder illustrates types and applications of Reeves speed reducers. REEVES PULLEY CO., Columbus, Ind.

Nickel Steel. "Pictorial Panorama of Progress" illustrates use and applications of nickel steel in various industries. INTERNATIONAL NICKEL CO., New York, N. Y.

Bearings. Bulletin 81 contains detailed illustrations of construction and installations of the Robins-Jones bearing. ROBINS CONVEYING BELT CO., New York, N. Y.

Safety Treads. Folder describes "Melflex," cotton cords embedded in rubber and specially fabricated. MELFLEX PRODUCTS CO., Akron, Ohio.

Electric Hoists. New 48-page catalog describes Wright electric hoists, giving dimensions and other useful information. WRIGHT MANUFACTURING CO., Bridgeport, Conn.

Electric Welding. "The Operator's Stabilizer" is full of short stories on electric welding and how to do it. LINCOLN ELECTRIC CO., Cleveland, Ohio.

Water Conditioning. Booklet reviews methods of conditioning boiler water, handling sludge concentration and blow down. ELGIN SOFTENER CORP., Elgin, Ill.

Buckets and Trailers. Bulletin explains construction features of the new "Champion" bucket and Williams' "Arch-Girder" trailer. G. H. WILLIAMS CO., Erie, Penn.

Jaw Crushers. Eight-page booklet describes improvements of the Telsmith Wheeling jaw crusher. Specifications and dimensions are given. SMITH ENGINEERING WORKS, Milwaukee, Wis.

Pulverizing Equipment. Folder illustrating and briefly describing different types of pulverizing equipment entitled "Unit Mills." RAYMOND BROS. IMPACT PULVERIZER CO., Chicago, Ill.

Hoists, Scrapers and Excavators. Supplement to Catalog 95 describes latest developments in Beaumont Electro-Auto hoists, cable drag scrapers and slackline cableway excavators. Illustrated. R. H. BEAUMONT CO., Philadelphia, Penn.

Sanitary Equipment. Loose leaf bulletin describes clarifiers, digestor tank mechanisms, sludge pumps, aerators, coagulation units and Ruggles-Coles dryers. Illustrations of installations are shown. HARDINGE CO., York, Penn.

Power Shovel. Bulletin describes and illustrates the new 37-B, 1¼ to 1½-yd. shovel-dragline-clamshell-lifting crane. All details are listed clearly and in large size. A complete set of specifications is included. BUCYRUS-ERIE CO., South Milwaukee, Wis.

Crusher. Bulletin 1465-B shows details of construction, describes features and gives a percentage diagram of the Superior McCully crusher product. Dimensions of various units are included. ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

Motors. Leaflet 20385-A describes the new type CS squirrel cage induction motor, which has a new W-frame with interchangeable mechanical and electrical parts. Some of the modifications and special applications are described. WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., East Pittsburgh, Penn.

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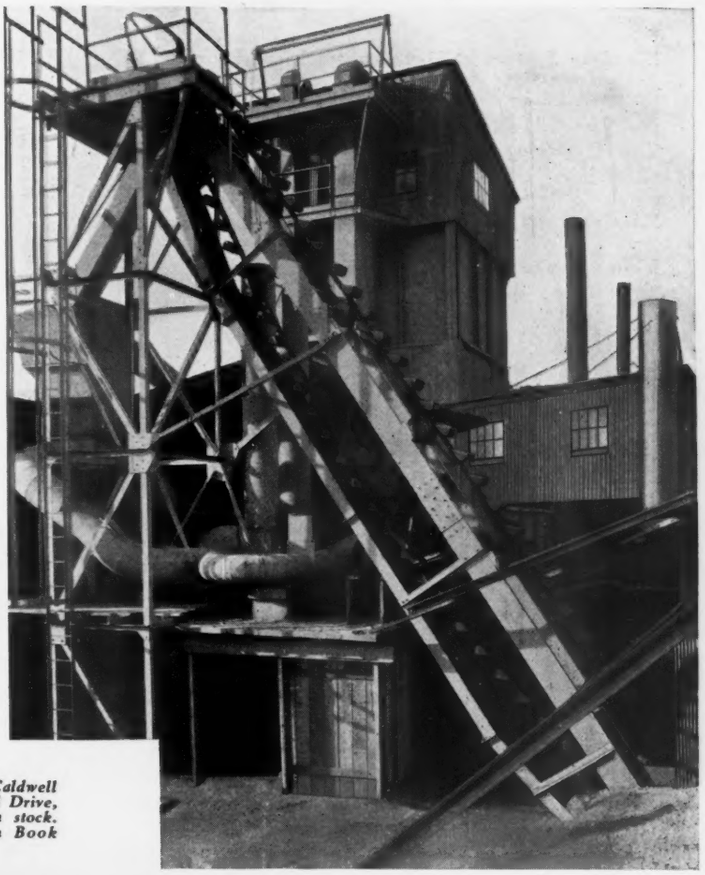

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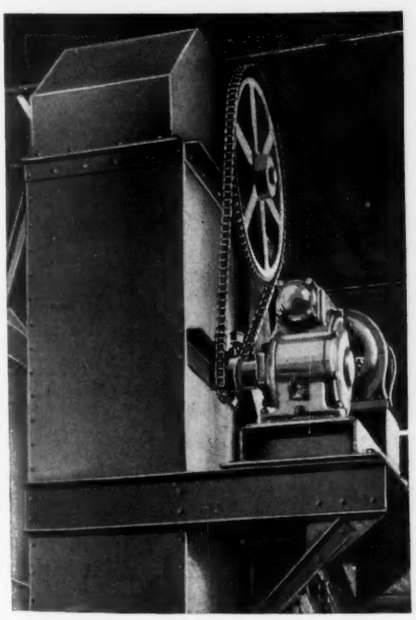

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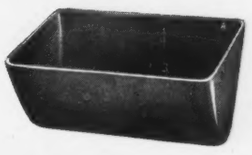

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